

**A PROSPECTIVE STUDY EVALUATING THE USE OF  
POLYPROPELENE MESH IN EMERGENCY SURGERY  
OF OBSTRUCTED HERNIAS**

**DISSERTATION SUBMITTED FOR  
BRANCH I –M.S (GENERAL SURGERY)**

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## **BONAFIDE CERTIFICATE**

This is to certify that the dissertation entitled “*A PROSPECTIVE STUDY EVALUATING THE USE OF POLYPROPELENE MESH IN EMERGENCY SURGERY OF OBSTRUCTED HERNIAS*” is the bonafide work of **Dr. SIVAKUMAR GANESHAN** in partial fulfilment of the university regulations of the Tamil Nadu Dr. M.G.R. Medical University, Chennai, for M.S (Branch I) General Surgery examination to be held in MAY 2018.

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## **DECLARATION**

I, **Dr. SIVAKUMAR GANESHAN**, do hereby declare that I carried out this work on “**A PROSPECTIVE STUDY EVALUATING THE USE OF POLYPROPELENE MESH IN EMERGENCY SURGERY OF OBSTRUCTED HERNIAS**” at the Department of Surgery, Govt. Rajaji Hospital, Madurai, under the guidance of **Prof. Dr. A.M SYED IBRAHIM MS, FIAS** Professor of Surgery, during the period of one year. I also declare that this bonafide work has not been submitted in part or full by me or any others for any award, degree or diploma to any other University or Board either in India or abroad. This is submitted to The Tamil Nadu Dr. M.G.R. Medical University, Chennai in partial fulfilment of the rules and regulations for the M.S degree examination in General surgery (Branch I) to be held in May 2018.

Place : Madurai.

Date :

**Dr. SIVAKUMAR GANESHAN**

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Place : Madurai.

Date :

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## TABLE OF CONTENTS

S.NO	CONTENTS	PAGE NO
1	INTRODUCTION	1
2	AIM AND OBJECTIVES	2
3	REVIEW OF LITERATURE	3
4	METHODOLOGY	69
5	RESULTS AND OBSERVATIONS	72
6	DISCUSSION	83
7	CONCLUSION	84
8	SUMMARY	85
	BIBLIOGRAPHY PROFORMA ABBREVIATIONS MASTER CHART ETHICAL COMMITTEE APPROVAL LETTER ANTI PLAGIARISM CERTIFICATE	

# INTRODUCTION

## **INTRODUCTION**

One of the most common complication regarding emergency hernia surgery is concerned is its recurrence rate .In cases of obstructed hernias whether umbilical, incisional & inguinal hernioplasty has added advantage over herniorrhaphy with regards to low recurrence rates, less postoperative pain , less chances of seroma,and less postoperative complications.The only contraindication for hernioplasty is gangrenous bowel or toxic fluid, which can lead to infection to mesh later, further to mesh rejection.

# **AIM AND OBJECTIVES**



## **AIMS AND OBJECTIVES**

- To evaluate the use of polypropylene mesh in the emergency surgery of obstructed hernias.
- To compare the outcome of patients operated using mesh (plasty) versus anatomical repair (rhaphy) in terms of immediate and early / late post operative complications.

# **REVIEW OF LITERATURE**

# REVIEW OF LITERATURE

## HISTORICAL ASPECTS OF INGUINAL HERNIA

*In the entire history of surgery, no subject has been as*

*Controversial as the repair of groin hernia.*

### **C.B. McVay**

The history of hernia, one of the most beautiful chapters in the triumphs of anatomy and surgery, is replete with ideas and realities, myths and facts, transmutations and Shadows. The history of hernia *in toto* is as old as human race. Inguinal hernias are recorded since 1500 BC by the ancient Greeks. The term hernia is derived from Greek meaning “offshoot, a budding or bulge.”

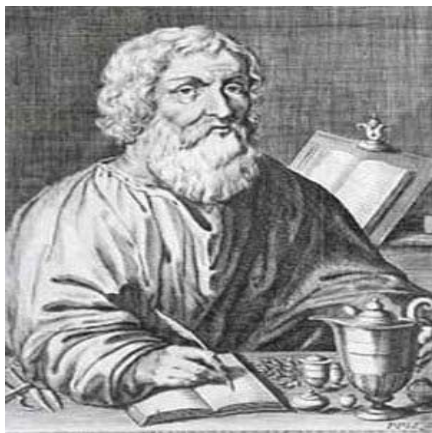
Hippocrates has barely mentioned about hernia in his writings (500 BC).

### **Ancient Times**

The word hernia is derived from the Greek word "Hernios", meaning "Nad" or "Shoot". Hernia is known to mankind since time immemorial. Shushruta in Vedic period described hernia as "Antra-vridhi" and had thought it to be incurable. Hernia is barely mentioned in the writings of Hippocrates (500 BC). The evolution of surgical treatment of inguinal hernia encompasses the trials and errors of surgeons practicing their art, for

thousands of years. Most of the evidence obtained from historical documents, suggest that throughout the ages, till the onset of 19th century, the mainstay of treatment of hernia has been conservative and the evolution of surgical treatment has closely paralleled that of surgery, in general. 3500 years ago.

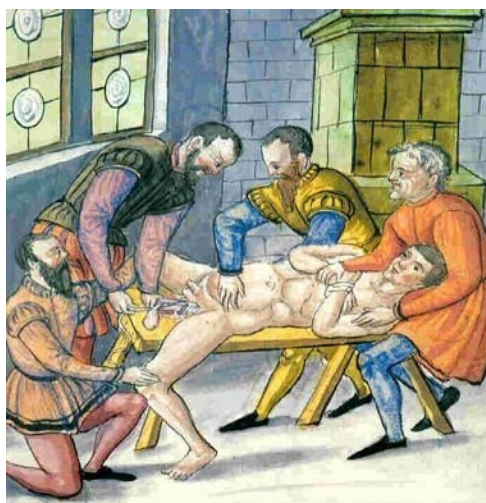
Egyptian physicians reported the management of hernia by conservative means that included the snugly fitting bandage for reduction and support.



Hippocrates (460-377 B C)



Aulus Celsus of Alexandria (50 A D)



Middle Dark Ages (476-15<sup>th</sup> Century)



Ambrose Pare (1570-1590)

The treatment by taxis for irreducible hernia has been traced back twenty four hundred years. The earliest mention of inguinal hernia is found in "Eber's papyrus" (1500BC), in which it is apparent that the pre-Homeric physicians treated the inguinal hernia by conservative methods. Aulus Celsus, the Greek encyclopedist and surgeon, documented (50AD) the use of transillumination to distinguish hydrocoele from hernias and described taxis for strangulation. Trusses and bandages were used for reducible hernia. Incomplete hernias (Bubonocoele) were distinguished from Complete (Scrotal) inguinal hernias by Paul of Aegina, around 700AD.

### **Medieval Period**

After the fall of Rome, religious prejudice against mutilation of the human body caused regression of surgical technique. During the lengthy dark Middle Ages, two important advances in herniology were made. Guy de Chauliac, from France (1363 AD), in his text "Chirurgia Magna", distinguished femoral from inguinal hernias. He developed taxis for incarcerated hernia, recommending the head down Trendelenberg position.

### **Post- Renaissance Period**

After the renaissance, autopsy and anatomic dissection spread throughout Europe. Started in Bologna in 1200 AD, knowledge about herniation accumulated rapidly. In 1700AD, Littre reported Meckel's diverticulum in hernial sac. In 1721, William Cheselden successfully operated on strangulated hernias. Heister (1724) in his monograph distinguished

indirect from direct inguinal hernias. Hunter and Percival Pott of London pointed out the congenital nature of some indirect inguinal hernia

'Antonio Scarpa' (1752-1832), in his treatise on hernia accurately described the sliding hernia, based on autopsy studies. Astley Patson Cooper (1768-1841), described for the first time the superior pubic ligament, which bears his name and transversalis fascia with full recognition of its role in the pathogenesis of hernias. Frenz Casper Hesselbach (1759-1816), contributed anatomic studies relative to groin hernia - Iliopubic tract and Hesselbach's triangle. Jules German Cloquet (1770-1883), dissected and sketched 345 cases of hernia.

### **Darn Repairs**

McArthur in 1921 used the pedicled strips of external oblique aponeurosis woven between the conjoint tendon and inguinal ligament. Gallie and Lemesurier in 1921, published papers on using fascia lata strips as sutures woven into the muscles and the inguinal ligament and the tissues of the posterior wall of the inguinal canal-- "Much as one would darn a sock". Ogilvy in 1936, practiced floss silk lattice repairs with non absorbable material which was followed by Maingot. Pratt, in 1948, used steel wire followed by Koontz, who used tantalum gauze in 1950. In 1948, Moloney introduced the forerunner of the modern nylon darn technique.

## **Patch Graft Repairs**

Whenever the local tissues were weak and attenuated, approximation of tissues was under tension, the sutures did not hold and the hernia recurred. So the surgeons thought of exogenous or endogenous prosthesis with good tensile strength. To start with, patch in the form of sheets of natural tissues and biological materials or synthetic sheets to fill the gap in the posterior wall of the canal were tried. Silver wire mesh used in most of the cases, were corroded, fragmented and were rejected through chronic sinuses and lead to recurrence. In 1940, Burke introduced tantalum metal sheets, but due to fragmentation of metal, hernia recurred. Surgeons started getting sheets of natural tissue flaps from fascia of thigh. Aponeurosis of external, internal oblique or rectus sheath were turned downwards and sutured to inguinal ligament. Mayr, in 1943, used skin graft. In 1958 Uscher introduced synthetic polyethylene mesh prosthesis to buttress and reinforce previously sutured repair. A variety of mesh designs and mesh placements have flourished since, Lichtenstein showed that mesh could be used successfully Lichtenstein 1986 Introduced tension-free repair by reconstructing floor of inguinal canal using prosthetic material, Concept of tension free repair introduced by Lichenstein in 1989. In 1991, Gilbert used suture less repair of small to moderate sized inguinal hernia by cones and swatch, i.e. a suture less patch was placed over the whole of the posterior inguinal wall to reinforce this "Swatch". A more controversial use of prosthetic materials concerns its use configured as swatch, plug or suture less patch. In this, a roll of material is

placed in the hernial orifice with or without suture to obstruct the passage of hernia to the exterior, popularized by Robbins and Rutkow in 1993.

Expanded polytetrafluoroethylene (ePTFE) has been adopted for both the external and pre-peritoneal approach, with good results. In recent years, sheaths of woven monofilament polyamide or knitted monofilament polypropylene have been used extensively. Recently, a bilayered patch device for inguinal hernia has been introduced. The unique feature of this polypropylene mesh device is that it has three components. Its underlay patch provides posterior mesh repair. Its connector has the desirable attributes of the plug repair. Its Onlay patch covers the posterior wall up to internal inguinal ring.

### **Pre-Peritoneal Repairs**

Thomas Annandale of Edinburgh presented for the first time in 1876, the concept of the pre-peritoneal approach. Lawson Tait of Birmingham, England, in 1883 reported the advantages of treating hernias by a median abdominal section. Bates (1913), repaired the defect from the posterior approach, using transversalis fascia. Cheatle (1920) renewed the interest in the pre-peritoneal approach. Henry, in 1936, suggested that this approach might facilitate the technical handling of inguinal and femoral hernias. This approach was strongly recommended by 'Nyhus' in 1960. The foremost proponent of today's pre-peritoneal approach is Stoppa, who recommends it, especially for problematic cases in which repeated repairs of



multiple recurrent hernias have been carried out, and in which tissues have become scarred and weakened and the normal anatomy is destroyed. Stoppa 1984 Devised procedure for reinforcing peritoneum using large unslit prosthesis Rutkow 1993 Modified mesh-plug repair .

### **Laparoscopic Inguinal Hernia Repair**

The wave of minimal access surgery has inevitably swept hernia repair along its surge. Ger and his colleagues, in 1982, through laparoscope used Michel staple applied with a Kocher clamp to close peritoneal opening of the hernia sac. y Schultz & co workers (1990) described “plug & patch laparoscopic inguinal herniorrhaphy y Spaw & co workers (1991) detailed anatomy with respect to laparoscopic approach. Toy & Smoot (1991) described intra peritoneal on lay patch technique (IPOM). y Dion & Morin (1992) described transabdominal preperitoneal patch (TAPP) technique. y McKernan (1992) described totally pre peritoneal patch technique (TEP).

There is no doubt, that the first appearance of the mammal, with his unexplained need to push his testicles out of their proper home into the air made a mess of the three layered abdominal wall that had done the reptiles well, for millions of years. In a highly synergistic way the skin, the parietal peritoneum and the embryologic and anatomic entities between them, produce the future pathway for the testes. The skin will form the scrotum in males and labia in females. The embryological entities between the skin and the peritoneum, permit the processes vaginalis to penetrate them and to form

the inguinal canal. The downward journey of the testis to the scrotum is thus allowed but, the descent of the ovary outside the peritoneal cavity is forbidden.

### **Inguinal Region**

The Testis originally lies on the posterior wall of the abdomen, at the level of the upper lumbar vertebrae on the medial side of the mesonephros, near the lower pole of the mesonephros by a peritoneal fold, called mesorchium. The descent or migration of testis into its corresponding scrotal chamber is accomplished by following the lead of the fibromuscular band – gubernaculum testis. It arises mainly within a peritoneal fold called the plica inguinalis, which stretches from the inguinal region to the lower end of the mesonephros. The gubernaculum attains greatest development about the sixth month, when it becomes a stout thick cord and is attached, above to the lower end of the testis and below it pierces through the abdominal wall, in its passage to the bottom of the scrotal pouch, thereby forming the inguinal canal. Along with it, a process of peritoneum the processus vaginalis descends into the scrotum, dragging with it thin fascial prolongations of the layers of the abdominal wall. Thus, the processus vaginalis receives coverings from the aponeurosis of the external oblique and internal oblique muscles and from fascia transversalis. As the passage through the abdominal wall occurs, the testes and cord structures are surrounded by vestiges of the external oblique (external spermatic), internal oblique (cremasteric fascia and muscle) and transversalis fascia (internal spermatic). The blind extremity

of the processus vaginalis gets invaginated in the form of a cup for the reception of the descending testis. As the migration of the testis proceeds, the gubernaculum shortens and eventually atrophies, but some trace of the gubernaculum persists at the bottom of the scrotum below tunica vaginalis. The shortened remains of the gubernaculum form the scrotal ligament, fixing the testis to the bottom of the scrotal pouch

## **ANATOMY OF GROIN AND THE INGUINAL CANAL**

*No disease of the human body belonging to the province of surgeon requires in its treatment, a better combination of accurate anatomical knowledge with surgical skill than hernia, in all its varieties.*

***Sir Astley Patson Cooper, (1804)***

The groin is that portion of the anterior abdominal wall below the level of anterior superior iliac spines. For proper orientation, the groin is referred to as the surgeon views the patient on the operating table. The pubis and superior pubic (Cooper's) ligament are medial. The epigastric vessels and transversalis fascia condensation at the internal ring are lateral. The anterior femoral sheath, iliopubic tract and inguinal ligament are inferior and the transverses abdominis aponeurosis and its arch are superior.

### **Skin**

Langer's lines are transverse in the groin with convexity facing downwards. The anterior superior spine of ileum is easily palpable in the

lateral groin and pubic tubercle on the lateral margin of the pubis. Spermatic cord is identified as it exits from the external ring which overlies the lateral aspect of the pubic tubercle. The deep ring is located approximately 2 cm above the skin crease between the thigh and the abdomen and midway between anterior superior iliac spine and pubic symphysis. The skin of groin is innervated by the **ilioinguinal, iliohypogastric and genital branch of genitofemoral** nerves.

### **Subcutaneous Tissues of Groin**

Divided into two strata - superficial fatty layer (Camper's fascia) and deeper membranous layer (Scarpa's fascia), which continues into perineum as the Colles fascia.

### **External Oblique Muscle and Aponeurosis**

It arises from the lower 8 ribs (5 to 12) and its fibers are directed downwards, forwards, and medially. From the anterior superior iliac spine to the pubic spine, the aponeurosis forms a free border which is called inguinal ligament. The muscle becomes totally aponeurotic in the groin with its fibers running obliquely downwards. It becomes the external layer of the anterior rectus sheath and further inserts on the pubis. The superficial inguinal ring is a triangular opening in the external oblique aponeurosis, 1 to 1.5 cm lateral to the pubic tubercle. The opening is formed by the splitting of external oblique.

## **Internal Oblique Muscle and Aponeurosis**

The internal abdominal oblique muscle lies between the external oblique and the transversus abdominis muscles. It originates from the outer half of the inguinal ligament, from the intermediate line on the iliac crests and from the posterior lamella of the lumbodorsal fascia through which it gains attachment to the lumbar spines. The anterior lamella accompanies the external oblique aponeurosis to form the anterior rectus sheath and the posterior lamella accompanies the aponeurosis of the transversus abdominis to form the posterior rectus sheath. They insert conjointly with those of the transversus abdominis into the crest of the pubis.

## **Transversus Abdominis Muscle and Aponeurosis**

This is the most internal of the three flat muscles of the abdominal wall. It passes medially in a transverse manner around the lateral aspect of the abdomen on to the anterior abdominal wall. This is the key layer, because of its role in hernia repair. The general layer of the muscle (lateral portion) and the aponeurosis (medial portion) is towards the linea alba, where it forms the anterior rectus sheath below the semicircular line of Douglas. In the groin it can be divided into continuous and discontinuous portions.

A. The continuous portion is the extension of the main muscle and aponeurosis, the lower border of which arches above and medial to cord structures and are called Transversus abdominis arch, which in 10% of cases due to its dense nature and insertion into the pubic tubercle and the crest is

called falx inguinalis. In 3% of cases the falx receives contribution from the internal oblique aponeurosis also thereby forming the conjoined Tendon.

B. The discontinuous portion lies below the transverses arch, forms the posterior wall of the inguinal canal, medial to the internal ring. One fourth of these fibers show marked individual variations and most often is deficient, represented only by the transversalis fascia, thereby forming a critical weak spot in the posterior wall of the inguinal canal. The inferior most edge of this layer is formed by the "iliopubic tract", a collection of aponeurotic fiber

### **Transversalis Fascia**

This is a portion of the endo-abdominal fascia that encloses the abdominal cavity and peritoneum. The portion which invests the transverses muscle and aponeurosis is called Transversalis fascia. It is continuous with the lumbar, iliac, psoas, obturator and rectus fascia. It is adherent to the transverses muscle - aponeurosis due to the numerous slips of fibrous tissue that traverse the muscle and attach to the deep interpareital fascia. Hence, practically it forms part of the transverses muscle aponeurosis fascia complex. At the deep inguinal ring there is a tubular projection of this fascia - internal spermatic fascia that extends outwards in a blunt funnel like fashion to cover the ductus deferens and the spermatic vessels. However, the blunt funnel is not perfectly conical, but is skewed and the axis of the funnel is less oblique than the axis of the vessels through the deep inguinal ring. The redundant

transversalis fascia in the medial side of the deep ring is called 'Transversalis fascia sling'. The transversalis fascia is somewhat like the letter 'V' with the open end pointing superolaterally to the groin and the diverging ends are called crurae. Most often, the posterior inguinal wall is represented only by this fascia and leads to weak spot in the groin.

### **Rectus Sheath**

In the groin aponeurosis of all the three flat muscles contribute to the anterior sheath.

### **Peritoneum**

In the groin as elsewhere, the peritoneum is a thin elastic membrane that serves only to provide a lubricating surface for its contained viscera. Because of the elastic character of the peritoneum it does not act in the prevention of hernia

### **The Conjoint Tendon (Falx Inguinalis)**

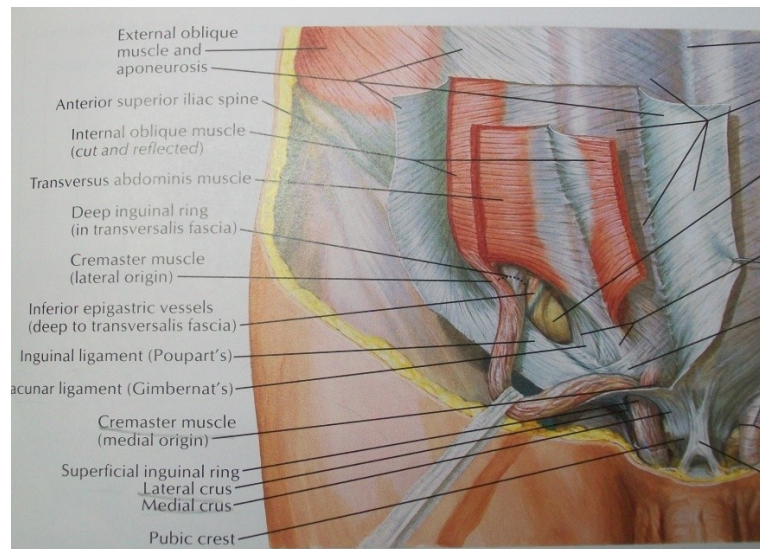
The aponeurosis of the transverses abdominis and the internal oblique are fused some distance lateral to the rectus sheath, the term conjoint tendon . This anatomic configuration, The transversus muscle contributes 80% of the conjoint tendon. The conjoint tendon lies lateral to the rectus muscle and immediately deep to the superficial inguinal ring. It passes down to its insertion deep to the inguinal and lacunar ligaments. The spermatic cord or round ligament of uterus lies anterior to it while passing through the

superficial inguinal ring. The conjoint tendon has a very variable structure and in 20% of the subjects it does not exist as a discrete anatomic structure - it may be absent or slightly developed or it may be replaced by a lateral extension of the tendon or original ring, so that no interval is present between the lower border of the transverses and the inguinal ligament.

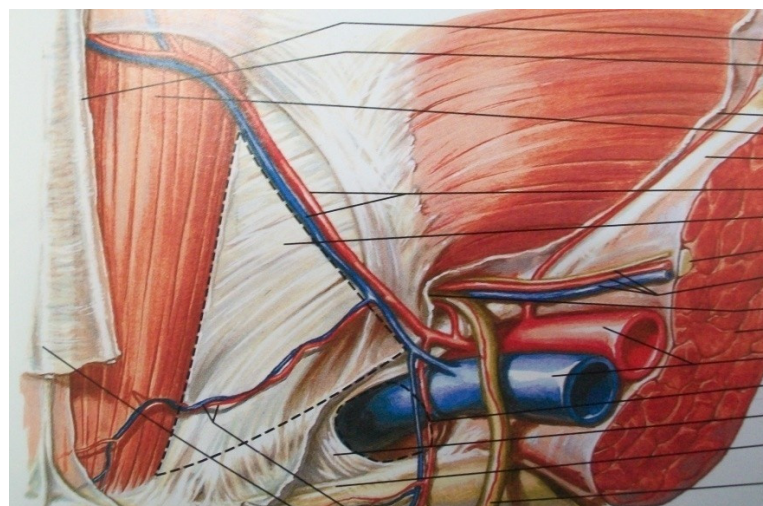
### **Cooper's Ligament (Iliopectineal Ligament)**

Cooper's ligament is remarkably constant in form and extent and represents the strongly reinforced periosteum of the superior ramus of the pubis. On the superior and internal aspect of superior pubic ramus, covering and immediately internal to the pectineal line, the periosteum is supplemented by a considerable quantity of dense fibrous tissue so that it usually becomes 2 cm or even 3 cm thick. Laterally, it continues posteriorly along the brim of the true pelvis, becoming progressively thinner until it can no longer be distinguished from periosteum of ileum. Cooper's ligament is particularly important in the surgical correction of femoral hernias and large direct inguinal hernias, because it forms a solid anchor along the inferior or posterior aspect of these hernial defects, through which sutures may be placed with confidence that they will hold.





## Deep ring and Superficial Inguinal ring



## Hasselbach's Triangle

### Inguinal Ligament (Ligament of Poupart)

It is the lower, thickened portion of external oblique aponeurosis extending from the anterior superior iliac spine to the pubic tubercle. Its edge is rolled inwards to form a gutter. The lower edge of the inguinal ligament is loosely bound to the fascia lata by the Innominate fascia. This fascia also serves to bind together the collagenous fibers of aponeurosis and

inguinal ligament. Medially, the inguinal ligament gets inserted on the pubic tubercle and fans downward to the superior pubic ramus as the lacunar ligament.

### **Lacunar Ligament of Gimbernat**

The ligament of Gimbernat is a triangular fascial extension of the inguinal ligament, before its insertion to the pubic tubercle. It is inserted at the pecten pubis and its lateral end meets the proximal end of the ligament of Cooper. It serves to broaden the attachment area for the inguinal ligament by fanning.

### **The Cremaster Muscle**

The cremaster consists of a number of loosely arranged muscle fascicles lying along the spermatic cord. They are united by areolar tissue to form the sac like cremasteric fascia around the cord and testis, within the external spermatic fascia. The lateral part of the muscle, arising from the inguinal ligament, has been variously described as in continuity with the medial edge of the internal oblique, deep to the internal oblique extending as far as the anterior superior iliac spine and in continuity with either the internal oblique or transverses or as a pointed tendon from the middle of the inguinal ligament piercing the internal oblique near its medial margin. The fibres pass along the lateral aspect of the spermatic cord through the superficial inguinal ring and then spread out into the fasciculi in loops, of increasing length along its anterolateral aspect.

## **Inguinal Canal**

It begins at the site of emergence of the spermatic cord through the transversus aponeurosis (internal ring) and ends at the pubic tubercle. It is oblique and 3.75 cm long, slanting downwards and medially, parallel with and a little above the inguinal ligament. It extends from the deep to the superficial inguinal ring. The boundaries are:

**Anteriorly:** Throughout by the skin, superficial fascia, external oblique aponeurosis, in its lateral one third by the muscular fibres of the internal oblique.

**Posteriorly:** The transversalis fascia, reinforced medially by the falx inguinalis (when present).

**Superiorly:** The arched fibers of internal oblique and transverses aponeurosis.

**Inferiorly:** The inguinal ligament and its continuation, lacunar ligament.

### **Hesselbach's Triangle**

It is bounded medially by the lateral border of the rectus sheath, laterally by the inferior epigastric vessels and below by the inguinal ligament.

**Spermatic cord:** Originates at the deep ring and consists of

- a. Arteries: Testicular, cremasteric and artery to vas.
- b. Veins: Corresponding veins, mainly testicular (pampiniform plexus).
- c. Nerves: Genital branch of genitofemoral nerve, cremasteric nerve, Sympathetic plexus derived from Para aortic and pelvic plexus.

d. Lymphatics of the testes.

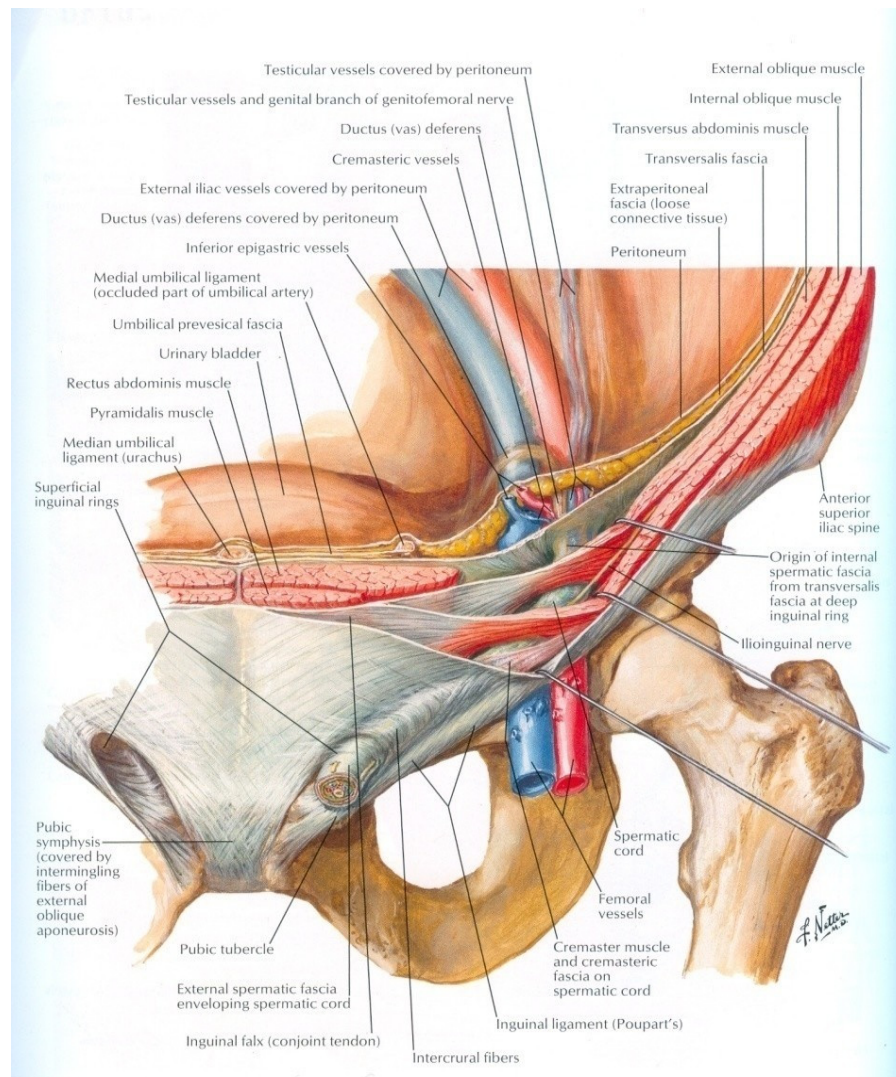
e. Vas deferens and areolar connective tissue.

Coverings of the spermatic cord from within are: processus vaginalis internal spermatic fascia (Transversalis fascia), cremasteric fascia (Internal oblique muscle and fascia) and external spermatic fascia (External oblique muscle and fascia).

**Blood Vessels and Nerves** The external iliac artery gives off two major branches, before crossing beneath Poupart's ligament, where it becomes the femoral artery. These tributaries, the deep circumflex iliac and the inferior epigastric vessels, are not vital. The latter, serves as the medial border of the deep ring, or the lateral border of the direct triangle. There is, therefore an additional method of identifying the position of the internal ring. The epigastric artery gives off two branches, the cremasteric and the pubic. The testicular artery arises directly from the aorta to supply the testis. The spermatic cord contains still one other small vessel, the umbilical artery, to supply the ductus deferens.

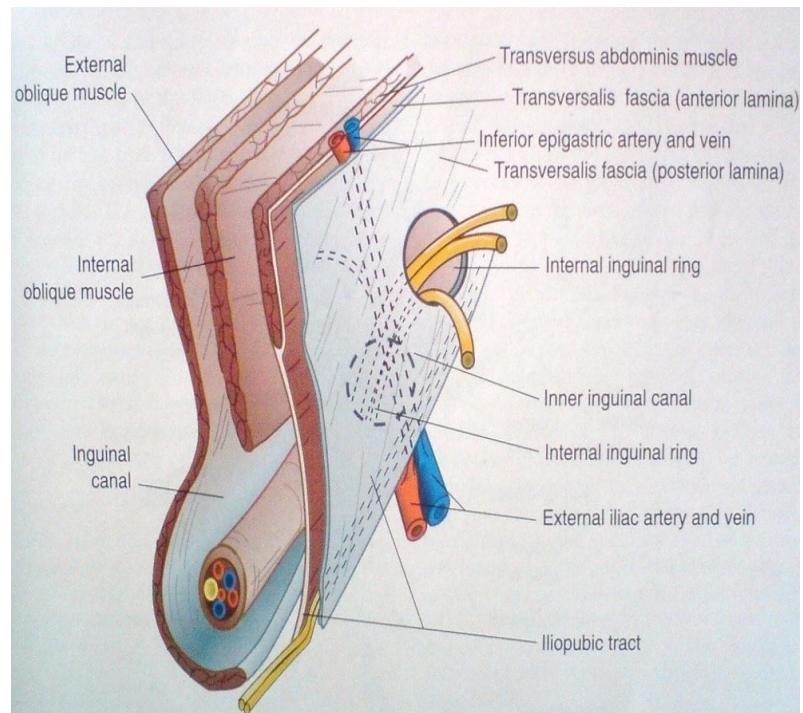
**Nerves** The essential nerves of the groin are the ilioinguinal, the iliohypogastric and the genitofemoral. The last, arising from L1 and L2 supplies the cremaster muscle, the skin of the scrotum and the medial aspect of the thigh, in females to mons pubis and labia majus. Its integrity is essential to the cremaster reflex. The ilioinguinal and iliohypogastric nerves arise primarily from L1. Just medial to the anterior superior spine these nerves traverse the

internal oblique and come to lie beneath the external oblique aponeurosis then Ilioinguinal nerve traverses the inguinal canal and emerges through the superficial inguinal ring.

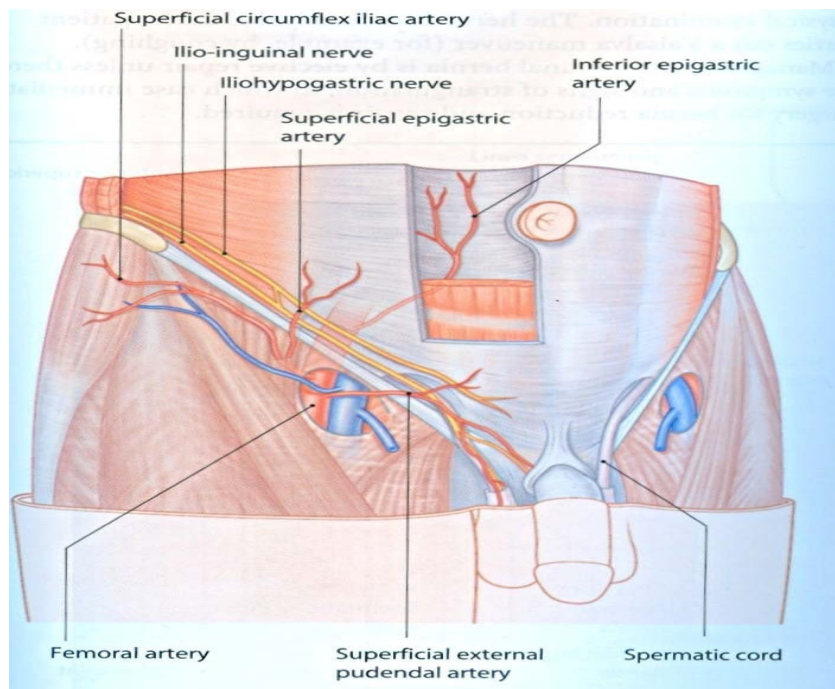


## Layers of Abdominal wall forming the Inguinal canal and its contents





### Inguinal canal and its contents



### Nerves and Blood Vessels at Groin

## **EPIDEMIOLOGY, ETIOLOGY AND PATHOPHYSIOLOGY**

Seventy –five percent of all abdominal hernias are found in the groin; Of all groin hernias,95% are hernias of the inguinal canal with the remainder being femoral hernia defects.Inguinal hernias are 9 times more common in men than in women, the inguinal hernia is still the most common hernia in women .The overall lifetime risk of developing a groin hernia is approximately 15% in males and less than 5% in females. There is clearly an association between age and hernia diagnosis. In the same way the complications of hernias (incarceration , strangulation ,bowel obstruction ) are found commonly at the extremes of age.Currently in this country approximately 700,000 operations for inguinal hernia repair are performed annually.The cause of hernia is multifactorial and it is assumed that the following factors are involved.

### **1. Evolution**

The absence of posterior rectus sheath below the arcuate line and only rather substantial transversalis fascia unsupported by muscles or aponeurosis resisting the intra-abdominal pressure and holding the breach between the abdomen and the thigh. It is compounded by humans having adopted the upright posture and change from quadrupedal to bipedal locomotion In man, the upright posture causes gravitational stress to pass down to the lower abdominal wall, which is structurally not designed for it nor has the evolution suited it for its new role.

## **2. Congenital and Anatomical Factors**

**a. Patent Processes Vaginalis:** Is the prime cause of indirect inguinal hernia in infants and children. The development of processus vaginalis, its migration and its final obliteration are intimately linked to the descent of the testis from the abdominal cavity into the scrotum. The incidence of patent processus vaginalis in adults who do not develop hernia during their life is up to 20%.

**b. Subtle varieties in the attachment and arrangement of abdominal muscles.**

**c. Females are particularly free of direct inguinal hernia:** The narrowness of the interval between the transversus arch and the inguinal ligament and the hermetical attachment of external oblique aponeurosis are the important factors in protecting women against direct hernia. On the other hand, musculoaponeurotic attachments in woman are such that they frequently develop femoral hernia. Other factors that are significant in the etiology are the number of aponeurotic fibers in the transversus aponeurosis which determines the intrinsic strength of the layer. The disposition of the transversus arch in relation to the Iliopubic tract indirectly determines the size of the inguinal gap or defect in the Hesselbach's triangle.

**d. The obliquity of the inguinal canal:** During sudden exertion increases the intraperitoneal pressure, compresses in the anterior and posterior walls of the canal thereby occluding the canal.



### **3. Shutter Mechanism**

The accepted explanation for this is the physiologic "Shutter mechanism" which is activated, when the abdominal muscles contract to raise the intra abdominal pressure. As the internal oblique and transverse abdominis muscles contract, their lower fibers forming the myoaponeurotic roof of the inguinal canal "the conjoined tendon", that arches over the spermatic cord also sharply contracts and as the fibers shorten, the arch straightens out and descends to come to lie close to or on the inguinal ligament and so covers and protects the fascia transversalis. The shutter also passes down in front of the internal ring and counteracts the pressure on the ring from inside the abdomen. Contraction of the transverse abdominis muscle also pulls up and tenses the crurae of the internal ring which make up the thickened bands of the iliopubic tract and fascia transversalis causing the ring to close like a sphincter snugly around the cord.

### **4. Integrity of the Fascia Transversalis**

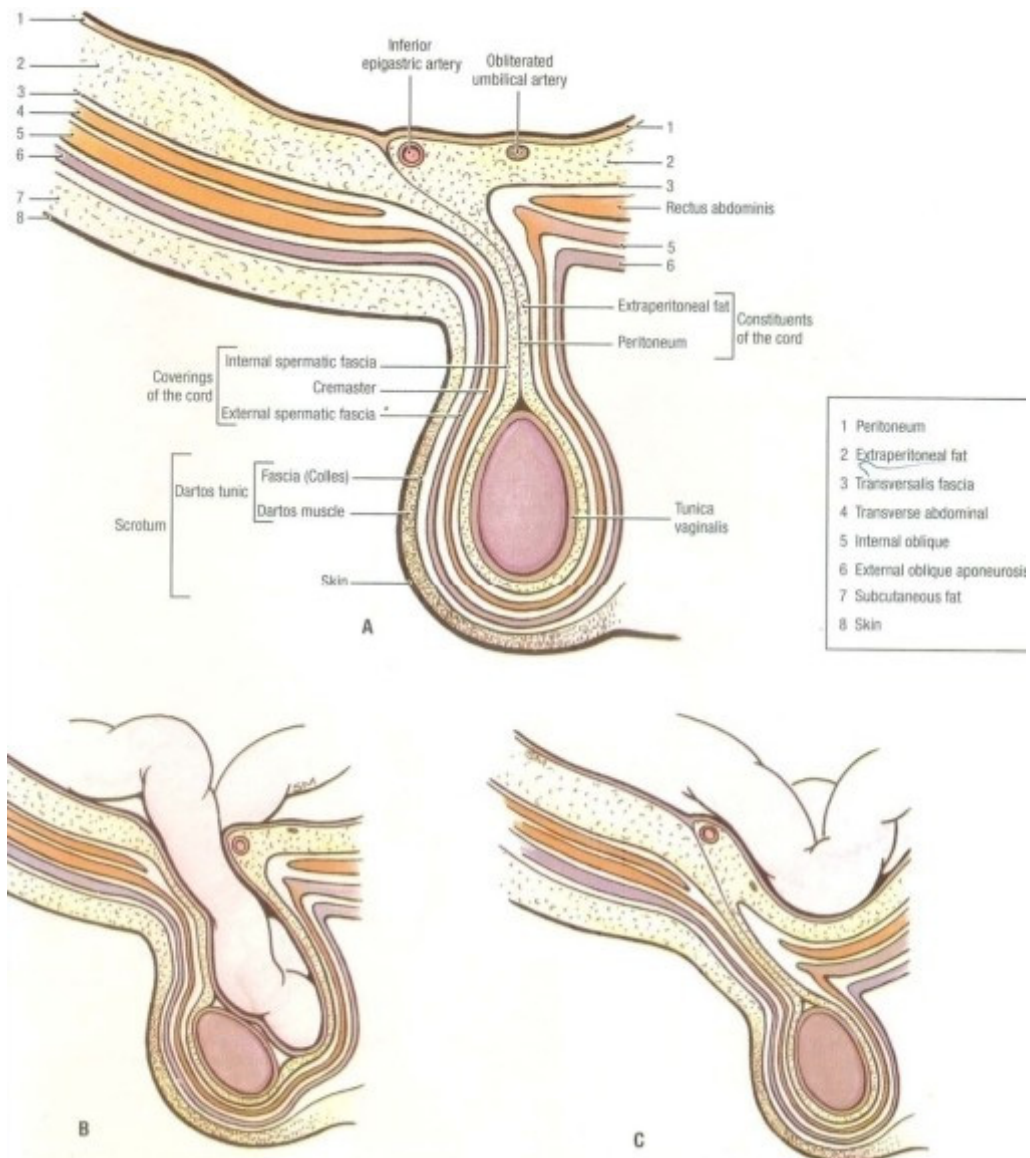
The ability of the fascia transversalis to withstand physiologic and pathologic elevations in the intra abdominal pressure is dependent on the state of the collagen fibers that make up its tissues and give its strength. The factor which interferes with normal production of collagen or causes its increased destruction or abnormal production of collagen fibers decreases the strength of transversalis fascia. These factors include congenital connective tissue disorders like Marfan's, Ehler-Danlos and Hurler-Hunter

syndromes and mesenchymal metabolic defects. It is found that substances in cigarette smoke inactivate anti-proteases in lung tissues and so upset the protease/antiprotease system which is responsible for destruction of elastin and collagen of the rectus sheath and fascia transversalis and predispose to herniation in smokers.

## **5. General Contributing Factors**

Like weakening of muscle and fascia by advancing age, lack of physical exercise, obesity and multiple pregnancies. Loss of weight and body fitness as may occur after illness, operation or prolonged bed rest, very low and unduly long transverse abdominal incisions for gynecological, urological and appendectomy incision. Pulmonary diseases like COPD and emphysema, prostatism, chronic constipation, diverticular disease, genito-urinary causes like cystitis, cystocele and urethrocele contribute to the formation of groin hernia.

Coverings in case of an indirect inguinal hernia are, from inside out, as follows:



**Coverings of inguinal hernia (A), Indirect (B), and Direct (C)**

## **Components of Inguinal Hernia**

**1.The sac** consists of a diverticulum of peritoneum, which is divided into mouth, neck, body and fundus.

**Mouth :** This is the part between the sac interior and the abdominal cavity.

**Neck :** This is the narrowest section between the mouth and the body of the sac.

**Body :** It lies between the neck and the fundus.

**Fundus :** This is the blind end or the distal most part of the sac.

## **2. Contents of Hernia**

These can be almost any abdominal viscera, except the liver. The commonest are;

- a. Fluid - Derived from peritoneal exudates, usually in congenital hernias.
- b. Omentum - Omentocoele (Synonym -Epiplocele).
- c. A loop of intestine - Enterocoele (Usually small intestine, but in some instances large intestine or vermiform appendix).
- d. A portion of the circumference of the intestine - Richter's hernia.
- e. A portion of urinary bladder wall or a diverticulum of the bladder.
- f. Ovary with or without the corresponding Fallopian tube.
- g. Meckel's diverticulum - Littre's Hernia.
- h. Two loops of intestine in the manner of W - Maydl's hernia.

- i. Rarely stomach, spleen or caecum may be found within the sac.
- j. Sliding or Hernia-en-Glissade (Contents - Caecum, Urinary bladder).
- k. Maydl's hernia or Hernia-en-W (Contents-W shaped loop of intestine)
- l. Dual hernia (saddle or pantaloons). Hernia, on either side of the inferior epigastric vessels.

## **CLASSIFICATION OF INGUINAL HERNIAS**

### **Clinical Classification**

This is based on the clinical presentation of hernia:

Reducible hernia

Irreducible hernia

Obstructed hernia (Incarcerated hernia)

Strangulated hernia

Inflamed hernia

### **Gilbert's Classification (Addition by Rutkow and Robbins)**

It is based on anatomical and functional defects established intra-operatively, categorized groin hernias into 5 types. Type 1, 2 and 3 were indirect whereas type 4 and 5 were direct.

## **Indirect Hernia**

**Type I :** Snug internal ring, intact canal floor.

**Type II :** One finger breadth internal ring, intact canal floor. Not more than 4 cm.

**Type III :** Two-finger breadth internal ring. Canal floor is defective (Scrotal and liding hernias).

## **Direct Hernia**

**Type IV :** Entire canal floor defective, no peritoneal sac anterior to canal floor, intact internal ring.

**Type V :** Diverticular defect, admitting no more than one finger, internal ring intact.

**Type VI :** Consists of both direct and indirect components.

**Type VII :** Covers all femoral hernias.

## **Nyhus Classification of Groin Hernias**

Is based on strict anatomic criteria, focusing on functional state of the internal ring and posterior wall of the inguinal canal.

**Type I :** Indirect inguinal hernia -- internal inguinal ring normal (Congenital hernia). **Type II :** Indirect inguinal hernia -- internal ring dilated but posterior inguinal wall intact, inferior deep epigastric vessels not displaced.

### **Type III : Posterior wall defects**

A. Direct inguinal hernia.

B. Indirect inguinal hernia - internal ring dilated, medially encroaching or destroying the transversalis fascia of the Hesselbach's triangle. (e.g. massive scrotal, Sliding or Pantaloon hernias).

C. Femoral hernia.

### **Type IV : Recurrent hernias**

### **Classification as per the Patency of Processes Vaginalis**

a. Vaginal hernia: b. Infantile hernia: c. Funicular hernia:

### **BEN DAVID TSD CLASSIFICATION**

Type	Anterolateral (indirect) Anteromedial (direct) Posteromedial (femoral) Posterolateral ( perivascular )
Stage	I. Sac in canal  II. Sac outside external ring  III. Sac into scrotum

### **Anatomical Classification**

a. Direct hernia

b. Indirect hernia c. Femoral hernia

## **Classification according to Descent of the Sac**

A. Bubonocoele

B. Funicular

C. Complete

## **CLINICAL FEATURES OF INGUINAL HERNIA**

### **History**

**Age:** Inguinal hernias occur at all ages. They may be present at birth or appear suddenly in an 80 year old. Peak times of presentation are in the first few months of life, in the late teens and early 20's and between 10 and 60 years. Indirect hernias are seen in young individuals where as direct are seen in older subjects.

**Sex:** Males are 20 times more commonly affected than females.

**Occupation:** Heavy work, especially lifting puts a great strain on the abdominal muscles. If there is an underlying weakness, the appearance of a hernia may coincide with strenuous physical effort. Hard labour workers, sportsmen and weight lifters are more prone.

### **Associated diseases:**

Many a times, hernia is due to diseases causing weakness of anterior abdominal wall like obesity, previous lower abdominal operations, ascites and Malgaigne's bulges. Certain diseases lead to increase in abdominal pressure such as prostatic enlargement, stricture urethra, chronic cough and respiratory disorders and chronic smoking.



**Local symptoms:**

**Pain :** The commonest symptoms are discomfort, heaviness and pain in the initial stages. The patient complains of a dragging, aching sensation in the groin, which gets worse as the day passes.

**Lump :** A lump in the groin is the second most common complaint. This may be a small lump of 2-3 cm or a huge lump going down to the knee level. Patient feels that it gets smaller when he lies down and bigger when he strains or stands.

**Systemic symptoms:**

If the hernia is obstructing the lumen of a loop of bowel, the patient may complain of one or more of the four cardinal symptoms of intestinal obstruction – colicky abdominal pain, vomiting, abdominal distension and absolute constipation. In late cases of strangulation where gangrene has set in, patient can present with features of peritonitis, more so if perforation of bowel has occurred.

**Signs**

**Inspection:** In standing position, a bulge or swelling will be seen in groin. This might disappear on lying down, if the hernia is reducible spontaneously in direct hernia. Impulse on coughing is present in reducible hernia. Loss of rugosities of scrotal skin in large inguino-scrotal hernias is seen. Visible peristalsis is seen in enterocele. Malgaigne's bulges are seen in patients with lax abdominal wall. An indirect hernia is sausage or pear shaped and lies parallel

to the inguinal ligament. After reduction it reappears more laterally and runs down above the inguinal ligament towards the scrotum. A direct hernia is more rounded, more medial, bulges forward and tends not to go down to scrotum. After reduction it reappears in a forward direction.

**Palpation:** Reducing the hernia by manipulation is called taxis and it is performed in lying down position of the patient. As the hernia is reduced following features are noted: a. Gurgling sound is felt in enterocele.

b. In enterocele first part takes longer to reduce and in omentocele later part. c. Impulse on coughing is felt.

**Internal Ring Occlusion Test:** Internal ring is occluded and patient is asked to cough. If a bulge is seen medial to the occluding finger, then it is a direct hernia, if not an indirect hernia.

**External Ring Occlusion Test:** After complete reduction, the external ring is occluded with a finger and patient is asked to stand up gently. The reducible inguinoscrotal swelling will not come down as its descent is prevented by occluding finger, whereas swelling fills gradually from below in case of varicocele and lymphvarix.

**Finger Invagination Test:** After reduction of the hernia, this test may be performed to palpate the hernial orifice. The skin is invaginated from the bottom of the scrotum by little finger, which is pushed up to palpate the pubic tubercle. The finger is then rotated and pushed further up into the superficial inguinal ring. Normal ring is a triangular slit which admits only the tip of a finger. When

the finger enters the ring, it goes directly backwards in direct hernia and it goes upwards, backwards and outwards in indirect hernia. The finger is again rotated so that the pulp of the finger faces backwards. The patient is again asked to cough. If the impulse is felt on the pulp of the finger, the hernia is a direct one, if it is felt on the tip, then it is an indirect hernia. “Sharma's ring”, may be felt in the sac during finger invagination test.

**Percussion:** Over the swelling, tympanic, if it is an enterocele and impaired or dull in case of omentocele.

**Auscultation:** Bowel sounds will be heard in enterocele.

**Always examine**

### **1. External Genitalia**

- Scrotum for thickened spermatic cord.
- Epididymis and Testes.
- Prepuce for phimosis and External urethral meatus for pinhole meatus.

### **2. Per Rectal examination**

**3. Per Abdomen Examination:** To rule out any abdominal mass, ascites and Divarification of recti.

**4. Respiratory System:** To rule out COPD and Koch's.

## **Differential Diagnosis of Inguinal Hernia**

### **I. When the swelling is incomplete i.e. an inguinal or a groin swelling:**

- a. Femoral hernia.
- b. Enlarged Inguinal Lymph Nodes.
- c. Saphena Varix:
- d. Femoral Aneurysm.
- e. Encysted Hydrocele of the Cord. f. Lipoma of the Cord.
- g. Undescended or Ectopic Testis.
- h. Psoas Abscess. i. Malgaigne Bulges. j. Spermatocoele.
- k. Lymph Varix.

### **II. When the swelling is complete i.e., inguinoscrotal swelling.**

- a. Infantile Hydrocele.
- b. Congenital Hydrocele.
- c. Encysted Hydrocele of the Cord: Already discussed. d. Varicocele.

## **COMPLICATIONS OF GROIN HERNIA**

Certain complications are well recognized. Others are not.

Irreducibility

Incarceration

Reduction-en-masse

Strangulation

Gangrene

Peritonitis due to perforation of the intestinal wall and

Malignant mesothelioma ( very rarely).

## **INVESTIGATIONS**

Laboratory and radiological aids are of limited use in the diagnosis of inguinal hernias. Routine laboratory investigations like Hb%, urine routine, blood urea, serum Creatinine will aid in the search of normal parameters before taking the patient for Surgery. Roentgenographic examination of the abdomen may reveal the patterns characteristic of intestinal obstruction with air and fluid filled loops of intestine on Plain x-ray erect abdomen as in complicated presentations of inguinal hernias. Ultrasound of the abdomen to know the obstructive urinary outflow diseases and Chest xray to find pulmonary pathology.

### **Herniography:**

According to the literature, herniography is used primarily in patients with unexplained groin pain, or to find nonpalpable, symptomatic cases of hernia recurrence. The technique of examination is described by Gullmo. A 20 to 22 gauge Veress needle is used to puncture the midline below the umbilicus. The catheter is guided into the lesser pelvis and 50

to 80 ml of contrast medium is injected. As the patients turns from side to side in the prone position, the contrast medium pools in the inguinal region. With the techniques now available, we believe that there is no indication for herniography, even if the complication rate is low.

## **TREATMENT OF INGUINAL HERNIAS**

Aim of treatment of inguinal hernia comprises of exposing the site of defect, correcting the anatomical defect, strengthening or reinforcing the deficiency in the posterior wall of the inguinal canal. Treatment of inguinal hernias is essentially surgical, exceptionally temporarily conservative, when efforts are made to keep the hernia in reduced state by clinical maneuvering, till the time the patient becomes fit for surgery.



## **TYPES OF SURGICAL TREATMENT FOR INGUINAL HERNIA**

**Herniotomy:** This is the essential and basic operation and it entails dissecting out and opening the hernial sac, reducing any contents and then transfixing the neck of the sac and removing the remainder. It is employed either by itself or as the first step in herniorrhaphy or hernioplasty. Herniotomy is sufficient for the treatment of hernia in infants and adolescents. In High herniotomy, the sac is removed at the level of deep inguinal ring.

**Herniorrhaphy:** refers to the strengthening or reconstruction of the posterior wall of the inguinal canal.

**Hernioplasty:** is the addition of grafts or prosthetics to herniorrhaphy (Reinforcement).

### **Bassini's Repair:**

This classical operation was first described by Bassini in 1888.

### **Indications:**

1. Indirect inguinal hernia in healthy young adults with good musculature, in whom the deep ring is not stretched.
2. Adults in whom the internal ring is stretched.
3. Also suitable for large indirect inguinal hernia where the internal ring is stretched and posterior inguinal wall is distorted.

**Aim of the operation:** To narrow the internal ring and to reinforce the posterior wall of the inguinal canal with conjoint tendon.

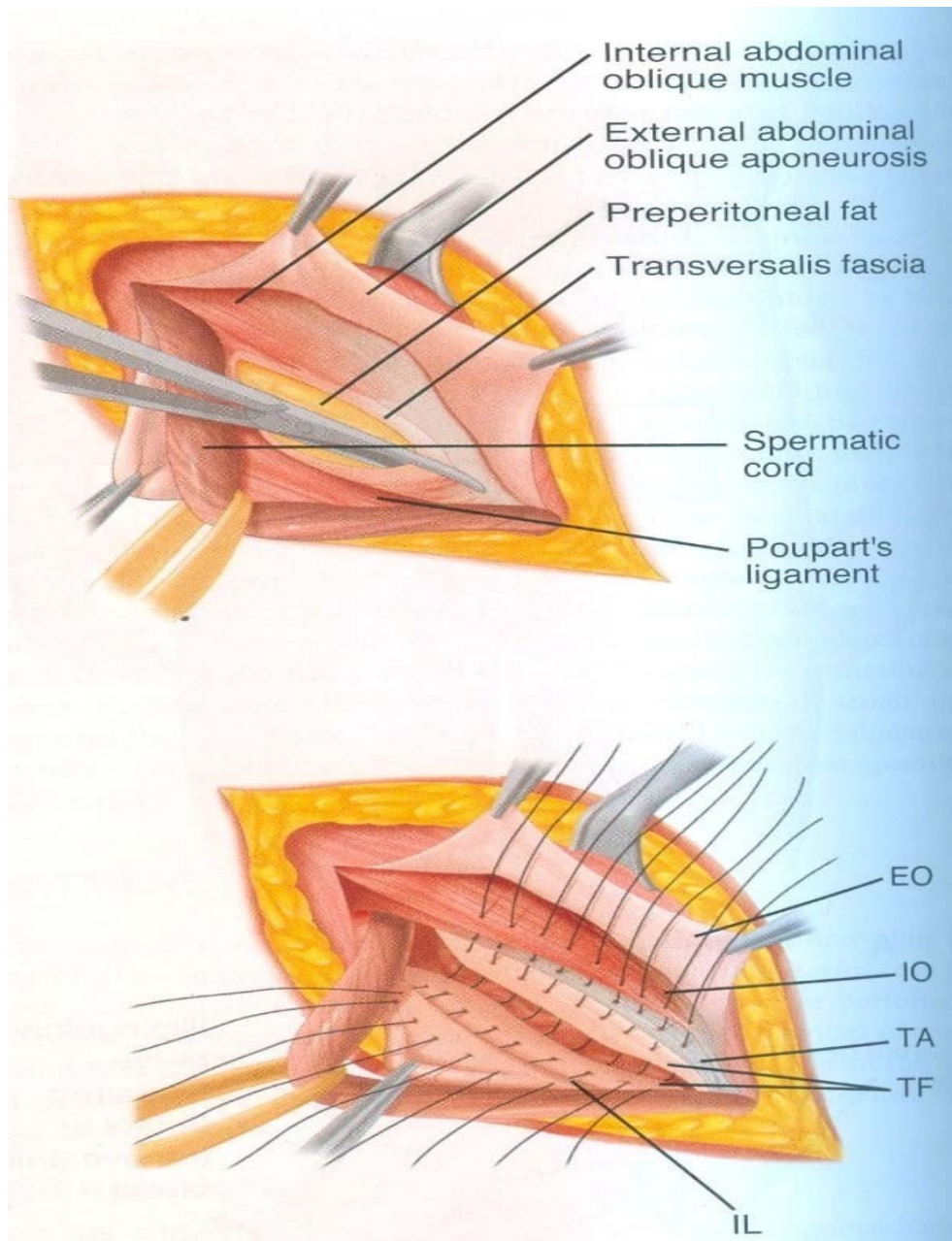
**Technique:** Simple herniotomy is done. The lower part of the conjoint tendon and upper surface of the inguinal ligament are carefully cleared off fat and areolar tissue. The muscle and tendon are lifted forwards on finger and 4 to 5 stitches are inserted at about one centimeter interval between conjoint tendon and the inguinal ligament at medial end of the canal, since it is the site of maximum recurrence. To make sure of closing the medial gap it is advised to take the first bite through the periosteum of the pubic bone. The stitches should be introduced at different depths into the inguinal ligament in order not to cause splitting of the inguinal ligament along the line of suture. In placing sutures in the inguinal ligament, care should be taken not to injure the external iliac vessels, which lie immediately deep to the inguinal ligament. Non- absorbable monofilament suture (prolene) is usually used but any other suture material of surgeon's choice can be used. It is particularly important that the stitches should not be too tight. Care should be taken not to include the iliohypogastric nerve. The conjoint muscle should lie snugly around the internal ring. Care should be taken not to tie the suture under tension. The cord is placed over the strengthened posterior wall and external oblique aponeurosis, sutured with interrupted or continuous suture. The skin wound is sutured.

**The darn:**

Obney and Ryan working with Shouldice at his hernia clinic, developed denovo a hernioplasty (1950-53) that is essentially identical to Bassini procedure. In this operation, the transversalis fascia is not



incised, but is imbricated with a continuous suture of at least two layers, approximating identical myoaponeuroticofascial layers between the conjoint tendon and the inguinal ligament. The darning is conducted from pubic tubercle up to and above the internal ring and back to the starting point. The darning is kept fairly loose and it forms a lattice upon which fibrous tissue is laid down. A darn does not draw tissues together and there is no tension in the stitches.



### Bassini Repair

## **Shouldice operation :**

The classical Shouldice method of hernial repair was described by Shouldice of Toronto (1908-1965). It is the most popular of those, using only local tissues. It is basically a multilayered Bassini's operation. In Shouldice hospital all operations are done under local anesthesia. After opening the inguinal canal herniotomy is done. The posterior wall repair is done by four layers using non absorbable 2/0 polypropylene.

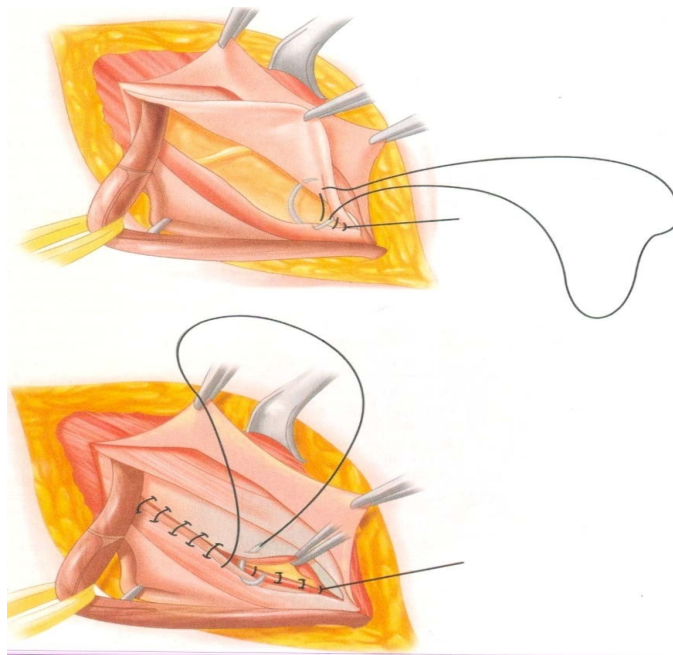
The first line of the repair: It is started from pubic tubercle and just medial to the internal ring, approximates the upper and lower flaps of transversalis fascia.

The second line of repair: the same running suture is used in the reverse direction. The full thickness of the upper flap, which includes muscle and aponeurotic fibers of the internal oblique and transverses muscles, is sutured to the inguinal ligament below. The third line of the repair: It is commenced just medial to the internal ring. Above, it picks up the surface of the internal oblique muscle and below, the undersurface of the lower flap of the external oblique aponeurosis close to the inguinal ligament.

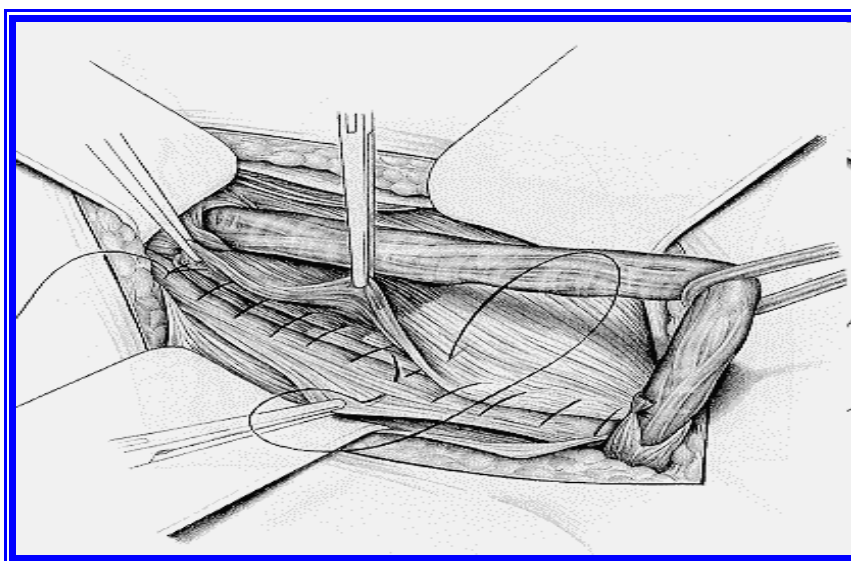
The fourth line of the repair: Returning from the pubic bone, this suture attaches the same structures of third line of repair to one another in a slightly more superficial plane, taking down as much of the lower flap as desired over the aponeurotic and muscle surface above. Closure of External oblique aponeurosis: When the spermatic cord and ilioinguinal nerve are

returned to the canal, they will lie in a higher arch than before, as 1 cm or more of the lower flap of the external oblique has been taken up by the repair. The new external ring will be higher and further lateral. The subcutaneous plane and skin is closed separately.

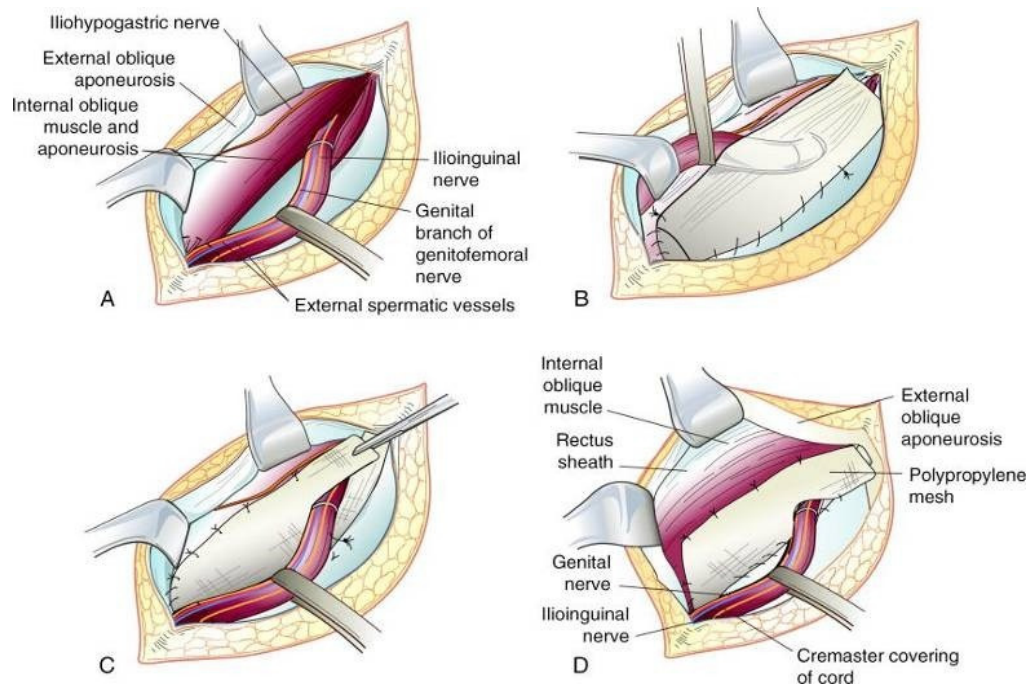
A



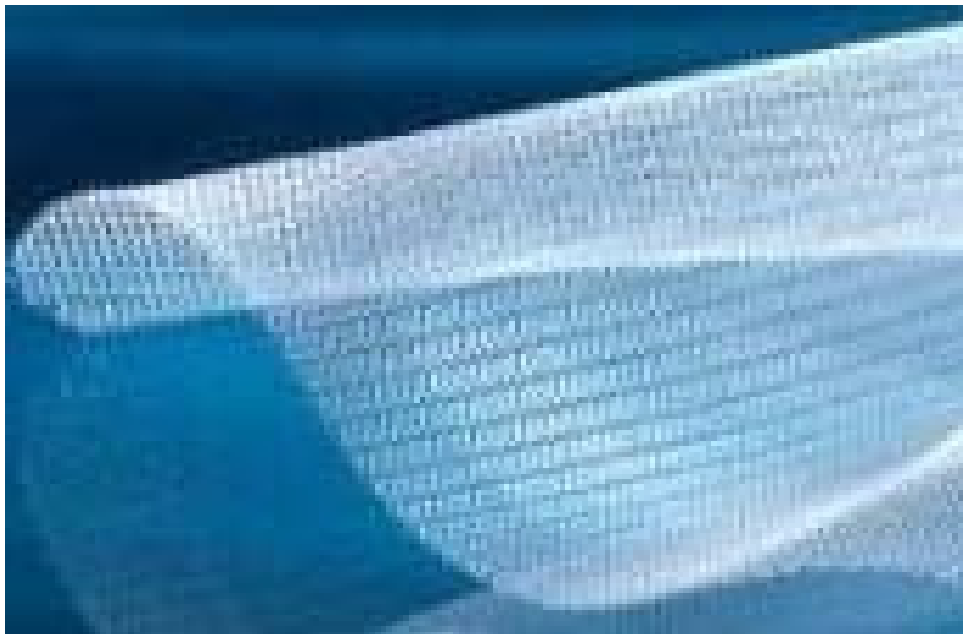
B



**Shouldice Repair (A and B)**



## Lichtenstein Tension free Mesh Repair



## Polypropylene Mesh

## **Tension – Free Mesh Hernioplasty (Lichtenstein Repair)**

In 1984, Lichtenstein described a "tension free" onlay of polypropylene mesh for inguinal hernia repairs. In this technique Lichtenstein repairs all primary direct and indirect hernias without closure of defect.

**Operative technique:** A transverse skin crease incision is deepened down to the external oblique aponeurosis. The spermatic cord is mobilized in the usual way. Direct sacs are inverted and imbricated using a non absorbable suture to flatten the posterior wall. Indirect sacs are dissected from the cord up to extra peritoneal fat and then either excised or inverted. High dissection, rather than high ligation, is the important feature of this stage. If deep ring is widened (Gilbert classification 2 or 3), a cone of mesh is inserted and anchored, usually superolaterally and sometimes inferiorly to the inguinal ligament by two or three non absorbable sutures. Inguinoscrotal sacs are transected in the canal and the proximal portion closed and dealt as mentioned earlier, whereas the mouth of distal portion is left undissected, but wide open.

**Onlay mesh** A polypropylene mesh is sutured along its lower border to the pubic tubercle, the lacunar ligament and the inguinal ligament to beyond the internal ring with a continuous suture of monofilament 3-0 polypropylene. The medial edge is sutured to the rectus sheath, also with continuous suture. The superior edge is tacked down to the aponeurosis or muscle of the internal oblique with few absorbable interrupted sutures while avoiding

injury to or entrapment of the iliohypogastric nerve. A slit is made at the lateral end creating two tails, a wider one ( $\frac{2}{3}$ ) above and a narrower one ( $\frac{1}{3}$ ) below. The lower edges of the two tails which encircle the cord are fixed to the shelving margin of Poupart's ligament. This creates a new internal ring made of mesh. The excess patch on the lateral side is trimmed, leaving approximately 3-4 cm of mesh beyond the internal ring. The wound is closed in a routine fashion with absorbable deep and subcuticular sutures.

### **Gilbert's sutureless Repair.**

Arthur L. Gilbert (1992) described a suture less repair of small and medium sized indirect inguinal hernias. The repair was performed by forming one swatch of polypropylene mesh into an umbrella plug, placing it through and immediately deep to internal ring. A second swatch with a slit in the upper part is placed as an overlay graft covering the canal's posterior wall, under and around the spermatic cord.

### **The Mesh Plug Hernioplasty (Robbins and Rutkow Repair)**

Robbins and Rutkow used this method to include treatment for all groin hernias, both primary and recurrent. In indirect inguinal hernia, high dissection of the sac is done which is simply placed back through the internal ring into the abdominal cavity. A mesh plug is inserted, tapered end first, through the internal ring and placed into position just beneath the crurae. The plug is kept in place by interrupted 3-0 vicryl.

## **Giant prosthetic reinforcement of visceral sac (GPRVS or Stoppa)**

Since Stoppa's original description, his technique for the procedure has been applied to a single groin hernia for use with local anaesthesia. The essential feature of GPRVS is the reinforcement of the transversalis fascia in the groin by a large prosthesis that extends far beyond the myopectineal orifice of Fruchaud. The prosthesis envelopes the visceral sac, held in place by intra-abdominal pressure and later by connective tissue in growth. The mesh adheres to the peritoneum and renders it inextensible so that it cannot protrude through the parietal defect. GPRVS is a sutureless and tension-free repair. GPRVS via a transabdominal incision directly provides access to the pre-peritoneal space and the parietal defects of hernias without dissection of the inguinal canal, spermatic cord, and sensory nerves of the groin. The recurrent rate of primary inguinal hernia is 0.7% and for recurrent inguinal hernia 0.8%.

## **Laparoscopic Inguinal Hernia Surgery**

Although, the laparoscopic approach is not minimally invasive, it has several advantages like, reduced postoperative pain and disability. The femoral and inguinal areas can be inspected bilaterally and repaired bilaterally in a single sitting. It avoids previous operative site in patients with recurrent hernias, decreasing the risk for nerve injury or ischemic orchitis. The disadvantages are the violation of the peritoneal cavity, need for general anesthesia and the cost of the procedure. For some patients general anaesthesia is contraindicated. For others, the laparoscopic technique is



too invasive a procedure. Although many different techniques of laparoscopic hernia repair are available, only the following two types of laparoscopic inguinal herniorrhaphy are in common use.

### **1. Transabdominal pre peritoneal (TAPP)**

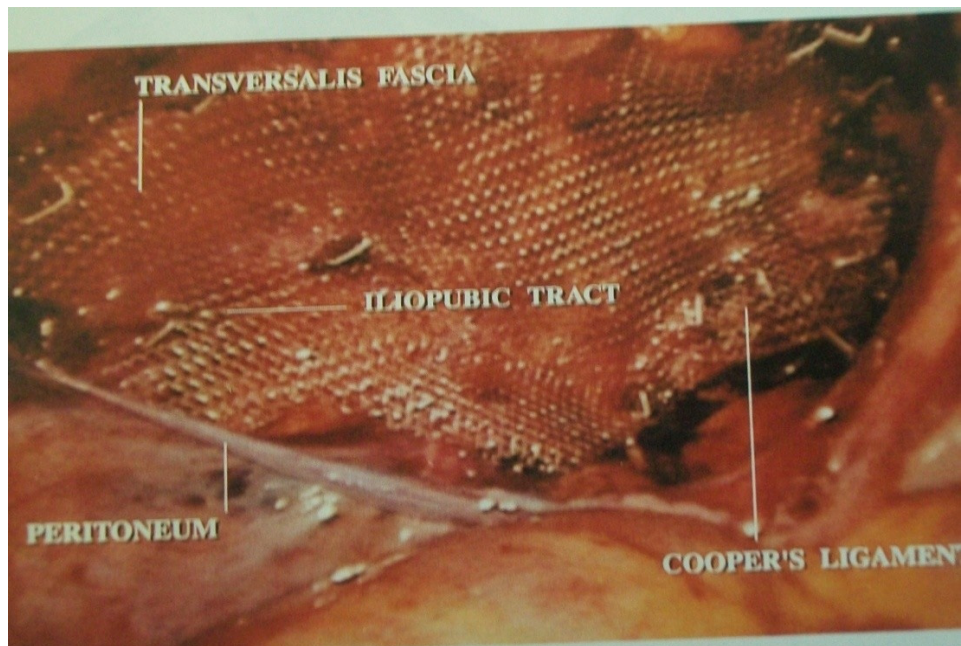
Presently, the most frequently used technique. Diagnostic laparoscopy is done to detect the presence of hernia. Peritoneum is incised transversely above the hernial defect and a complete dissection of pre-peritoneal space is accomplished using instruments placed intra abdominally via accessory ports. During the course of pre- peritoneal dissection, direct sacs are reduced and indirect sacs are either dissected from the cord structures and reduced or divided circumferentially at the internal ring, leaving the distal sac in place. Prosthetic mesh required for TAPP ,and a large piece of polypropylene mesh (16/12cm) is used to cover the myopectineal orifices including direct, indirect ,and femoral hernial spaces.The prosthesis is either slit to accommodate the cord structure or simply placed over them according to surgeon's preference. Finally the mesh is stapled in place using the following landmarks.

- a. Symphysis pubis medially.
- b. Superiorly, transversalis fascia above the internal ring.
- c. Laterally, an arbitrary point approximately 1 cm medial to ASIS. d. Inferomedially Cooper's ligament.
- d. Inferolaterally Iliopubic tract.

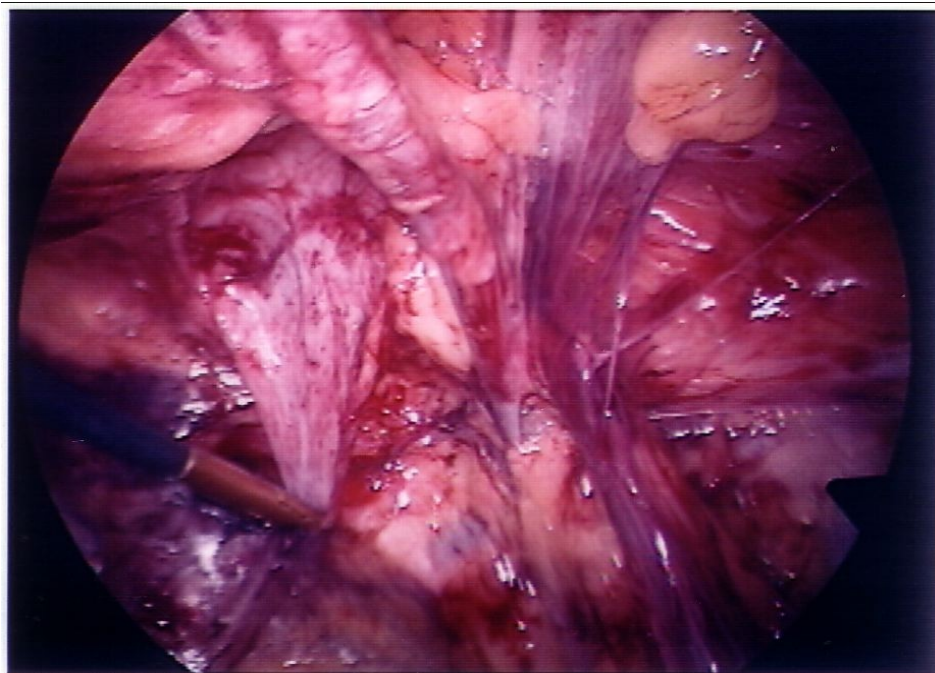
It is the preferred technique, in patients with lower abdominal wall incision, which results in peritoneal adherence.

## **2. Totally Extra Peritoneal Herniorrhaphy (TEP)**

Approach is totally extra-peritoneal in which avoids bowel and vascular injuries and intra peritoneal adhesions. A 1.5 cm infra-umbilical incision is made and advanced through the subcutaneous tissues to expose the rectus muscles, which are separated bluntly. A tunnel is developed between rectus muscles and the underlying pre-peritoneal fat by retractors or by use of balloon dissection device. The peritoneum has been dissected of the posterior aspect of the rectus muscle and the pubic symphysis is exposed. Dissection is continued up to iliac crest, the cord structures are inspected, if indirect sac is present it is reduced. Polypropylene mesh is placed such that it covers all hernia orifices (direct, indirect, femoral and obturator). In case of bilateral hernia two mirror image pieces of polypropylene mesh are prepared.



**Laparoscopic Hernia Repair (TAPP)**



**Laparoscopic Hernia Repair (TEP)**

## **COMPLICATIONS OF INGUINAL HERNIA SURGERY**

Nothing so prevents the occurrence of complications as one's awareness as well as fear of them. The complications cannot be eliminated altogether. They may be minimized by meticulous and precise surgical techniques.

### **Intra operative Complications**

- Haemorrhage
- Severance of nerve
- Nerve-entrapment by sutures
- Severance of testicular blood supply
- Trauma to vas deferens
- Damage to intestine
- Injury to the bladder
- Transection of spermatic cord

### **Post operative complications**

- **General:** Systemic complications occur at a rate comparable with that after other surgical procedures of the same magnitude. Atelectasis and pneumonitis were most frequent followed by thrombophlebitis and urinary retention.

- Scrotal Ecchymosis.
- Swollen Testis
- Ischemic orchitis and testicular atrophy• Hydrocoele
- Wound infection
- Recurrence

A weakness in the operation area necessitating further operation'. There is no question that, both through anatomical knowledge and skilled technique are necessary for successful repair. Absence of tension in the completed hernial repair is essential to the success of repair. Recurrence, after 6 months are due to factors other than technical error or selection of inferior procedure . Recurrence is also due to decreased collagen synthesis. Prevention of recurrence is done by supplementing the basic repair with additional support by prosthetic mesh.

The over all recurrence reported is 10% for primary and 25% for recurrent inguinal hernia.

### **Others**

Urinary retention,  
 Neuroma,  
 Haematoma,  
 Seroma,  
 Sinus formation,  
 Sexual dysfunction.

## **PHYSIOLOGY AND ANATOMY OF CHRONIC GROIN PAIN AFTER INGUINAL HERNIORRHAPHY**

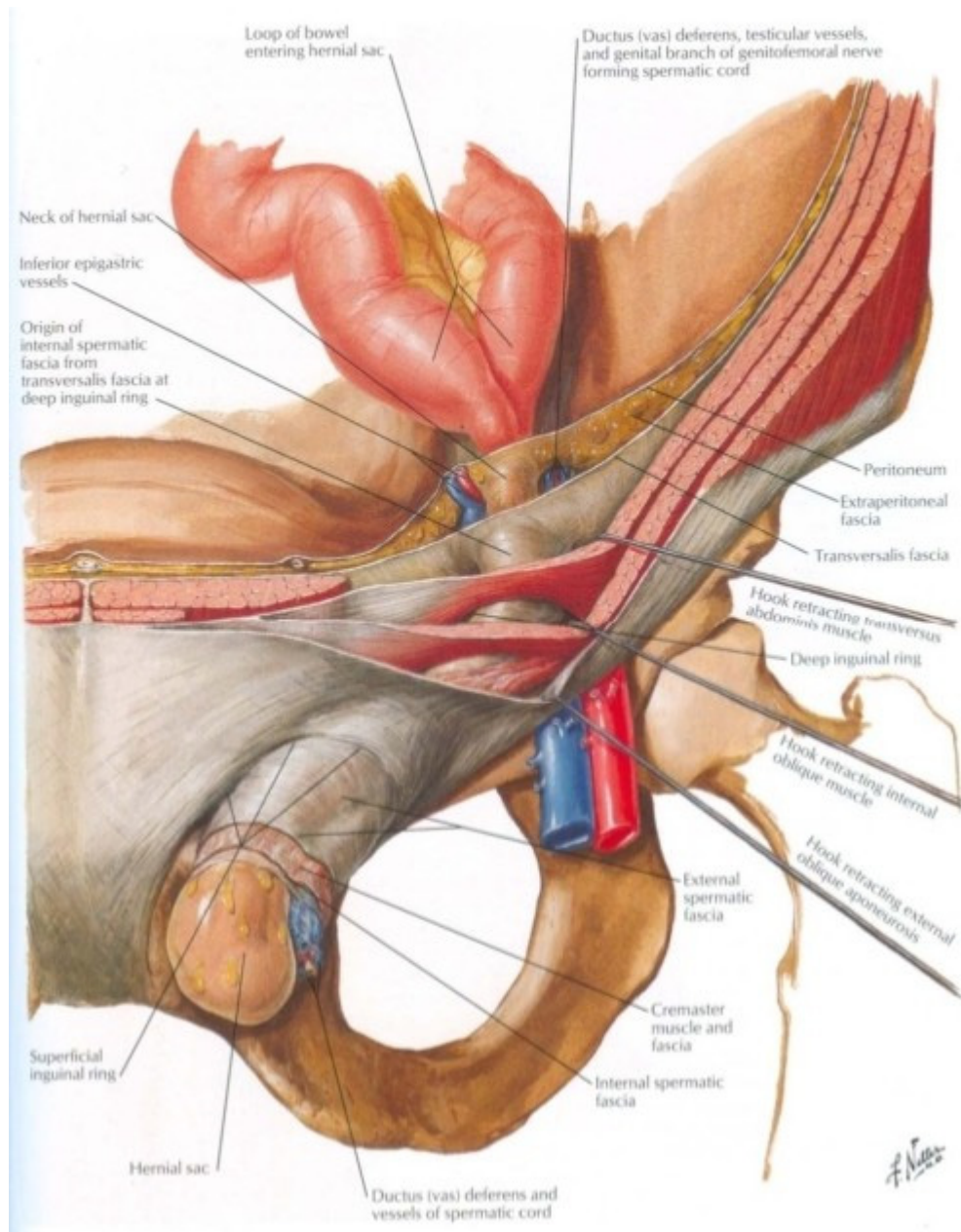
Pain is defined as “an unpleasant sensory and emotional experience with actual or potential tissue damage or described in terms of such damage” by the International Association for the Study of pain. Chronic groin pain lasts >3 months. Chronic groin pain can be Nociceptive or Neuropathic



**Bilateral direct Inguinal Hernia**



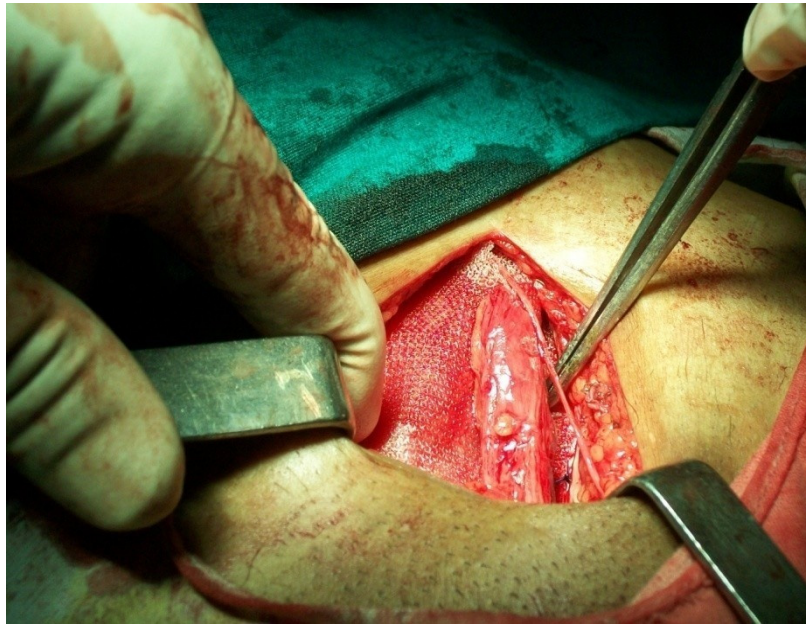
**Lt sided Indirect Inguinal Hernia**



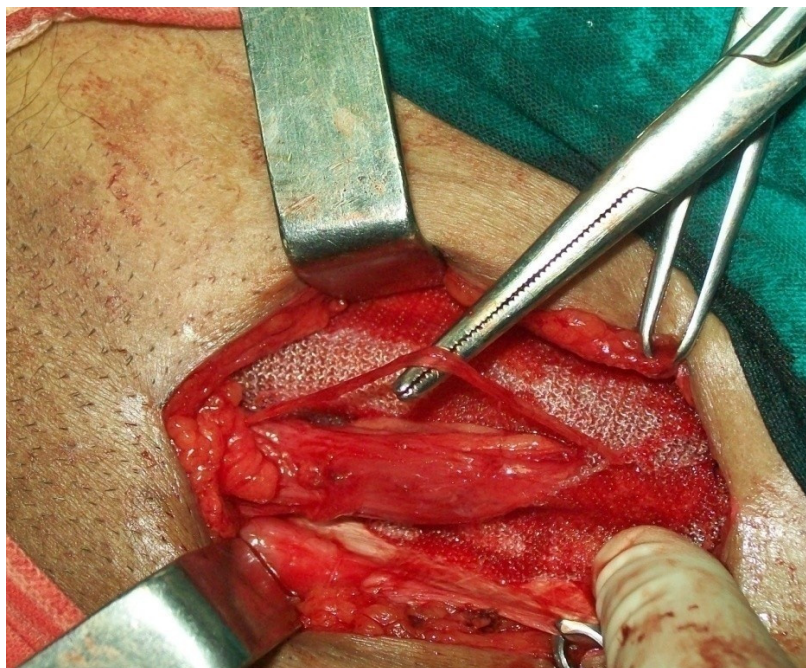
**Hernial sac with Indirect Component**



**A**



**B**



**Polypropylene Mesh placement**



## UMBILICAL HERNIA

The anterior abdominal wall is a complex layering of muscles, aponeuroses, and fascia. The most obvious feature is the umbilicus, which represents the cicatricial remnants of the former umbilical cord and vessels. Typically, it lies at the midpoint between the xiphoid process and the pubis, depending on the amount of subcutaneous adipose tissue. The midline is further defined by the linea alba, which extends from the xiphoid to the symphysis pubis. It can be seen as a linear furrow in the anterior abdominal wall of muscular patients and is situated between the medial borders of the rectus abdominis muscles. The linea alba is composed of dense, crisscross fibrous bands from the blending aponeuroses of the external oblique, internal oblique, and transversalis muscles from both sides of the abdominal wall. The linea alba begins quite broad at the xiphoid, measuring 1 to 2.5 cm, as the rectus sheath fibers diverge to insert on the fifth, sixth, and seventh costal cartilages. Below the level of the umbilicus, the linea alba narrows to a fine line between the rectus muscles as it inserts on the pubis. Several tendinous intersections extend from the linea alba medially to the convex lateral rectus sheath border, the linea semilunaris, and firmly adhere the rectus muscles to the anterior rectus sheath.



## ETIOLOGY

The formation of ventral hernias is a multifactorial and complex process. Three causes of ventral hernias are recognized: congenital, incisional, and spontaneous. Hernias present at birth are congenital and are most often treated during the pediatric period of life. As previously defined, any hernia of the anterior abdominal wall occurring through a previous surgical incision is incisional. Ventral hernias most commonly found along the midline linea alba are spontaneous. Although they are typically supraumbilical in location, they can occur anywhere along this structure, and more than one hernia may be found. As previously described, the interlacing fibers of the aponeuroses in this portion of the linea alba are pierced by small blood vessels and nerves. Through these openings, extraperitoneal areolar tissue may herniate and produce an epigastric

hernia. The hernia opening is usually 1 cm in size or smaller and frequently asymptomatic.

Extrusion of extraperitoneal fat may or may not be accompanied by a sac of the subjacent peritoneum. Although frequently referred to as lipomas, the fatty tissue is not a tumor; it is a mushroom-like mass of pre-peritoneal encapsulated fat with a feeding artery that usually comes through a tight, small defect. When a sac is present, it is generally small and barely protrudes through the opening in the fascia. This sac may not become apparent until the surrounding preperitoneal fat is removed. Small epigastric hernias increase in size slowly because the fascial ring through which they protrude is strong and unyielding. If a larger sac is present, it may contain omentum, intestine, and other viscera. Umbilical hernias are relatively common in the adult population and are another example of a spontaneous. The lateral abdominal wall is composed of three layered flat muscles. The external oblique, the most superficial, courses inferior from its lower costal origins to its insertion on the iliac crest, forming the inguinal ligament, and medially to fuse with the internal oblique. Below that layer is the internal oblique, which originates from the lateral half of the inguinal ligament and fans out following the shape of the iliac crest with the superior fibers coursing obliquely upward toward the lower three or four ribs. These fibers form the superficial part of the deep inguinal ring. The innermost muscle layer, the transversus abdominis, courses horizontally and joins medially with the internal oblique aponeurosis. As with the internal oblique, many inferior fibers contribute to the inguinal region. The preperitoneal space separates the deep fascia layer

from the peritoneum and often contains fat, which is more prominent in the lower part of the abdomen. The blood supply to the anterior abdominal wall is derived from multiple sources.

The upper part of the abdomen receives blood from the superior epigastric artery and the terminal branch of the internal thoracic artery in combination with collateral branches of the lower intercostal arteries. The lower part of the abdomen is supplied by the inferior epigastric and deep circumflex iliac arteries which are branches of the external iliac vessels. The superior and inferior epigastrics are continuous with each other deep to the rectus muscle. Nerves supply the anterior abdominal wall by running between the internal oblique and transversus abdominis muscles. The nerves then pierce superficially through the rectus sheath as anterior cutaneous nerves. Branches originate from the lower thoracic nerve roots (T7-T9) superior to the umbilicus, T10 innervates the periumbilical skin, and T11-L1 supplies the infraumbilical area. The most recent randomized trial compared interrupted, rapidly absorbable suture (Vicryl) with continuous, slowly absorbing suture (polydioxanone suture [PDS] and MonoPlus) and was unable to detect a difference in hernia recurrence between the two groups; however, it appeared that PDS had the lowest overall rates of recurrence.

This data led to a conclusion that a continuous, slowly absorbable fascial closure may lead to the lowest incidence of incisional hernia. A recent randomized trial also investigated the role of suture length on hernia recurrence and wound infection. The trial found that a stitch length four times as long as the

wound and bites of only 5 to 8 mm from the wound edge reduced the rate of incisional hernia from 18% to 5.6% and the rate of surgical site infection from 10.2% to 5.2% when compared with traditional closure techniques. Finally, a randomized, controlled trial comparing midline versus transverse incisions for abdominal procedures showed no difference in long-term hernia occurrence rates. It is recommended that the method of incision be based on surgeon preference and the planned procedure. As laparoscopic techniques have become popular in nearly all aspects of abdominal surgery, it appears intuitive that at least the complexity, if not the incidence, of ventral hernias should decrease.

Laparoscopic trocar site hernias are not rare and occur at a rate between 0.6% and 2.8%. It is taught that fascial defects larger than 5 mm should be closed in adults; however, some surgeons argue that dilating, noncutting trocar sites up to 10 mm do not need to be closed with suture. A recent study evaluating these ports actually showed a 0.66% hernia rate in 12-mm radially dilating, noncutting trocars, supporting closing these ports with suture. Regardless of the size of the incision, infection, poor tissue healing, increased abdominal pressure, and other factors can give rise to a hernia. Additionally, closing only the anterior fascia can result in the rare Richter, or preperitoneal, hernia, which can be difficult to diagnose without repeat laparoscopy or laparotomy.

## **SYMPTOMS**

Ventral hernias are often noted by the patient as a bulge in their abdominal wall. They can be exacerbated by any action that raises intraabdominal pressure,

including coughing, performing a Valsalvamanuever, lifting weights, or elevating the head or legs. Occasionally patients can report pain or discomfort associated with their hernia that will often resolve with rest or reduction of the incarcerated hernia; however, this relief may be only temporary. Smaller hernias are often asymptomatic or may produce intermittent complaints. Discomfort or a ventral bulge is the most common initial symptom, but bowel obstruction can also be the first symptom that ventral hernia. More than 166,000 umbilical hernia repairs are performed annually in the United States, making it the second most prevalent abdominal wall hernia after inguinal hernia. Sometimes, these umbilical hernias can be the result of a recurrence or persistent congenital umbilical hernia. In 90% of patients, it is an acquired defect that is a direct result of chronically increased abdominal pressure. Numerous factors have been linked to increased abdominal pressure including multiparous status, obesity, and cirrhosis with ascites. Umbilical hernias tend to be more common in females and often develop in the fourth to fifth decade of life. The fascial ring that constitutes the neck of the hernia can be dense and is formed by gradual yielding of the cicatricial tissue closing the umbilical ring. In children younger than 2 years old, most umbilical hernias often close spontaneously; however, in adults these hernias tend to enlarge with time. Numerous patient-related factors, some of which are controversial, may lead to the formation of ventral hernias as well as a recurrence and include obesity, older age, male gender, sleep apnea, smoking, emphysema and other chronic lung conditions, prostatism, abdominal distention, steroids, and jaundice. Some evidence suggests that certain biochemical

processes, including collagen deficiencies, may lead to an increased rate of both aneurysmal disease and hernia formation. These collagen defects also are implicated in a higher rate of incisional hernia formation after aortic surgery and in spontaneous abdominal wall hernias. Every year, 4 to 5 million laparotomies are performed with a hernia developing in 2% to 36% of these incisions. This gives rise to an excess of 150,000 ventral hernia repairs each year. Technical factors, such as slip-page of knots, suture fractures, excessive tension, or rapidly absorbable sutures, can result in an increased rate of incisional hernias. A surgical-site infection at the time of initial surgery has been reported to double the risk of herniation.

The ideal closure method for midline abdominal incisions has been the subject of numerous clinical trials and still lacks a clear consensus among surgeons. Ideally, the suture material used should retain high tensile strength until substantial wound healing has occurred and a monofilament to prevent bacterial attachment among the fibers. Additionally, evidence exists showing that permanent suture may serve as a potential nidus of infection. The two main variables that have been compared are absorbable versus nonabsorbable suture, and continuous versus interrupted closure technique. A recent metaanalysis sought to answer the question of suture permanence. In this study, the principal investigators divided suture material into rapidly absorbable, slowly absorbable, and nonabsorbable types. They included only prospective, randomized, controlled trials with at least 100 patients and followup of at least 1 year in their analysis. They identified 6566 patients from 15 studies. Closure of the midline

abdominal incision by continuous, rapidly absorbable suture resulted in a statistically higher rate of incisional hernias than did closure by either continuous, slowly absorbable suture ( $P<.009$ ),

## **INDICATIONS FOR SURGERY**

Abdominal wall hernias in adults do not spontaneously heal or close, and nearly all enlarge with time. In most patients, if they are an appropriate surgical candidate, the presence of a hernia is an indication for repair that allows the potentially dangerous sequelae of incarceration, obstruction, or strangulation to be avoided. When questioned, surgeons thought that pain and limitations of daily activities were the most important indications for repair. Regardless, nearly 23% of repairs were performed in asymptomatic patients in an effort to avoid serious consequences. As stated, hernias tend to enlarge over time; therefore, delaying repair can often make it more difficult. However, the true natural history of untreated ventral hernias remains unknown at this time and is the subject of several ongoing trials.

## **BIOLOGICS**

The most rapidly changing aspect of hernia surgery today has been the introduction of biologic tissue grafts. The market value for these materials is expected to increase, far exceeding the growth of synthetic mesh. These prosthetics include both allograft and xenograft sources of tissue. The premise for these products is a decellularization and protein stabilization process that preserves the structural architecture of the tissue of origin but removes any cells



that could precipitate a foreign-body reaction. These products, essentially an acellular collagen implant, allow remodeling by the host via native fibroblasts migrating into the graft with subsequent collagen deposition. They can be differentiated based on the original tissue source or post harvesting processing techniques (i.e., crosslinking, sterilization, and decellularization). Little peer reviewed scientific data are available to compare these grafts in a clean or clean contaminated ventral hernia repair. Theoretically, they provide a framework for, they have been typically reserved for contaminated ventral hernia repair in which a synthetic mesh is felt to be contraindicated. Several studies with medium-term followup have reported that these grafts do not result in a long-term, durable hernia repair when used as a bridge across a fascial defect. Typically, maneuvers to achieve fascial closure and utilization of the graft.

## INCISIONAL HERNIA

Of all hernias encountered, incisional hernias can be the most frustrating and difficult to treat. Incisional hernias occur as a result of excessive tension and inadequate healing of a previous incision, which may be associated with surgical site infection. These hernias enlarge over time, leading to pain, bowel obstruction, incarceration, and strangulation. Obesity, advanced age, malnutrition, ascites, pregnancy, and conditions that increase intra-abdominal pressure are factors that predispose to the development of an incisional hernia. Obesity can cause an incisional hernia to occur because of increased tension on the abdominal wall from the excessive bulk of a thick pannus and large omental mass. Chronic pulmonary disease and diabetes mellitus have also been recognized as risk factors for the development of incisional hernia. Medications such as chemotherapeutic agents and surgical site infection can contribute to poor wound healing and increase the risk for developing an incisional hernia. Large hernias can result in loss of abdominal domain, which occurs when the abdominal contents no longer reside in the abdominal cavity. These large abdominal wall defects also can result from the inability to close the abdomen primarily because of bowel edema, abdominal packing, peritonitis, and repeat laparotomy. With loss of domain, the natural rigidity of the abdominal wall becomes compromised and the abdominal musculature is often retracted. Respiratory dysfunction can occur because these large ventral defects cause paradoxical respiratory abdominal motion. Loss of abdominal domain can also result in bowel edema, stasis of the splanchnic venous system, urinary retention,

and constipation. Return of displaced viscera to the abdominal cavity during repair may lead to increased abdominal pressure, abdominal compartment syndrome, and acute respiratory failure.



### **Treatment: Operative Repair**

Primary repair of incisional hernias can be done when the defect is small ( $\leq 2$  to 3 cm in diameter) and there is viable surrounding tissue, or in cases in which the hernia was clearly a result of a technical error at the initial operation, such as a suture fracturing. Larger defects ( $> 2$  to 3 cm in diameter) have a high recurrence rate if closed primarily and are repaired with a prosthesis. Recurrence rates vary between 10% and 50% and are typically reduced by more than 50% with the use of prosthetic mesh.

Prosthetic material may be placed as an onlay patch to buttress a tissue repair, interposed between the fascial defect, sandwiched between tissue planes,

or put in a sublay position. Depending on its location, several important properties of the mesh must be considered.

#### Prosthetic Materials for Ventral Hernia Repair Synthetic Materials

Various synthetic mesh products are available. Desirable characteristics of a synthetic mesh include being chemically inert, resistant to mechanical stress while maintaining compliance, sterilizable, noncarcinogenic, inciting minimal inflammatory reaction, and hypoallergenic. The ideal mesh has yet to be defined. When selecting the appropriate mesh, the surgeon must consider the position of the mesh, whether it will be in direct contact with the viscera, and the presence or risk of infection. Mesh constructs can be classified based on weight of the material, pore size, water angle (hydrophobic or hydrophilic), and whether there is an antiadhesive barrier present.

When placing a mesh in the extraperitoneal position without the risk of bowel erosion, a macroporous unprotected mesh is appropriate. Both polypropylene and polyester mesh have been successfully placed in the extraperitoneal position. Polypropylene mesh is a hydrophobic macroporous mesh that allows for the ingrowth of native fibroblasts and incorporation into the surrounding fascia. It is semirigid, somewhat flexible, and porous. Placing polypropylene mesh in an intraperitoneal position directly apposed to the bowel is avoided because of unacceptable rates of enterocutaneous fistula formation. Recently, lighter weight polypropylene mesh has been introduced to address some of the long-term complications of heavyweight polypropylene mesh. The definition of lightweight mesh as corticosteroids

# **METHODOLOGY**

## METHODOLOGY

This is a prospective study comprising 54 patients of obstructed hernia over a period of from march 2016 to August 2016 with 12 months follow-up. In this present study, the clinical material consists of patients admitted with obstructed hernia (both males and females) in the Department of General Surgery at Government Rajaji Hospital, Madurai.

### **Method of collection of data:**

The size of the sample work to 54 cases. 36 cases with hernioplasty (group A) 18 cases with herniorraphy (group B).

### **Inclusion Criteria:**

Patients admitted with obstructed hernias (Inguinal, umbilical & incisional).

Cases above age 15 years of age

Cases diagnosed as obstructed hernia

Operated in emergency operation theatre

Cases who underwent release of obstruction

Cases who consented for the study

**Exclusion Criteria:**

Patients below 15 years of age.

Patients who underwent previous tissue repair

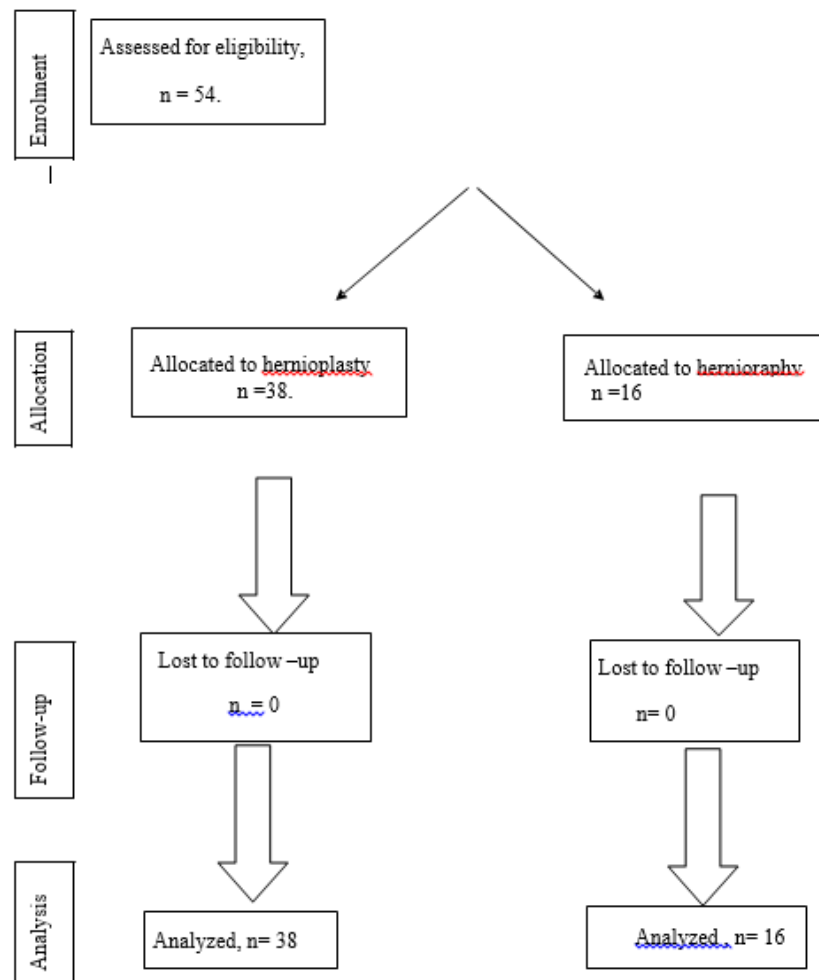
Patients who did not give consent for study

The data will be collected in prescribed PROFORMA where in it contains, particulars of the patient, Clinical history, clinical examination and diagnosis, Relevant investigations, and details of surgery.

**FOLLOW-UP**

Period of follow up being 12 months from the day of surgery. Parameters used for comparison-Age, Sex, Time duration, Pain, Seroma, Hematoma, Wound infection, Retention of urine Recurrence Ethical clearance has been obtained from ethical committee of Government Rajaji Hospital, Madurai.

**Statistical analysis: statistical analysis was done using chi square test**





# **RESULTS AND OBSERVATIONS**

## **RESULTS AND OBSERVATION**

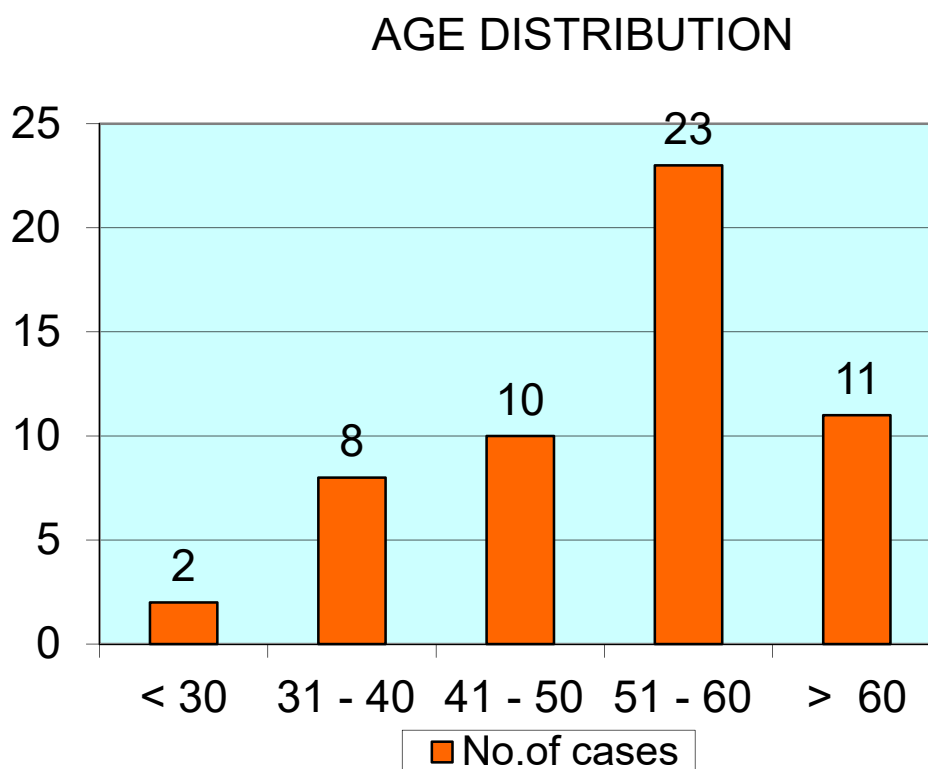
A total of 54 patients of obstructed hernias who underwent emergency surgery in Department of general surgery, Government Rajaji Hospital, Madurai during the period from march 2016 to august 2017, were included in this prospective study, and randomized into two groups .Patients with (Group A) 38 patients with HERNIOPLASTY, and 16 patients with herniorrhaphy (Group B). Patients were evaluated , age, sex, time of presentation , pain, seroma, and wound complications, recurrence

Patients who underwent hernioplasty and herniorrhaphy were evaluated for recurrence rates and it was found that no recurrences occurred out of the 38 cases of hernioplasty, while 4 cases out of the 16 cases of herniorrhaphy developed recurrence with a significant p value of 0.011.

**Table 1 : Age Distribution**

Age in years	No.of cases	Percentage
< 30	2	3.7
31 - 40	8	14.8
41 - 50	10	18.5
51 - 60	23	42.6
> 60	11	20.4
Total	54	100.0

Patients are taken from age >30 ->60 of which 42.6 % of patients where 50-60 age groups

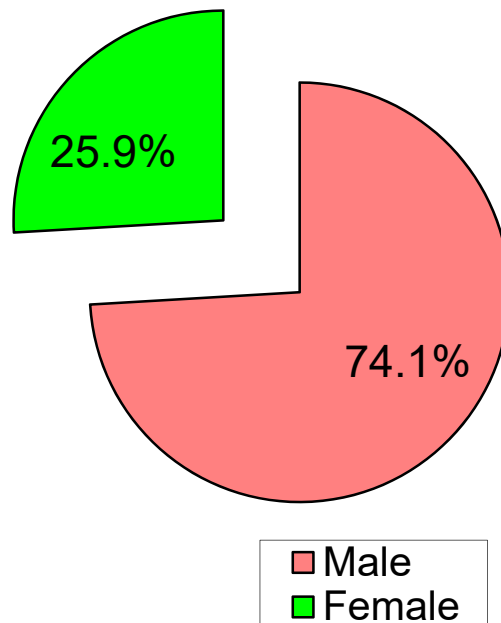


**Table 2 : Sex Distribution**

Sex	No.ofcases	Percentage
Male	40	74.1
Female	14	25.9
Total	54	100.0

Of the total 54 cases , 40 were male and 14 female

### SEX DISTRIBUTION

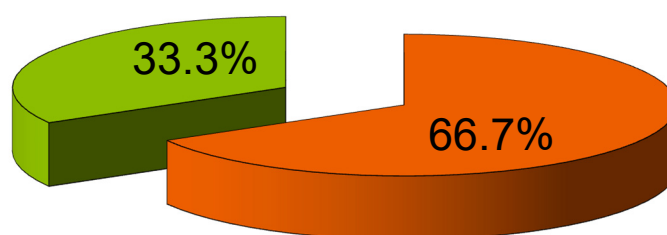


**Table 3 : Procedure**

Procedure	No.of cases	Percentage
Hernioplasty	36	66.7
Herniorraphy	18	33.3
Total	54	100.0

For 66.7% of the cases hernioplasty was done and rest 33.3% herniorraphy was done

### PROCEDURE

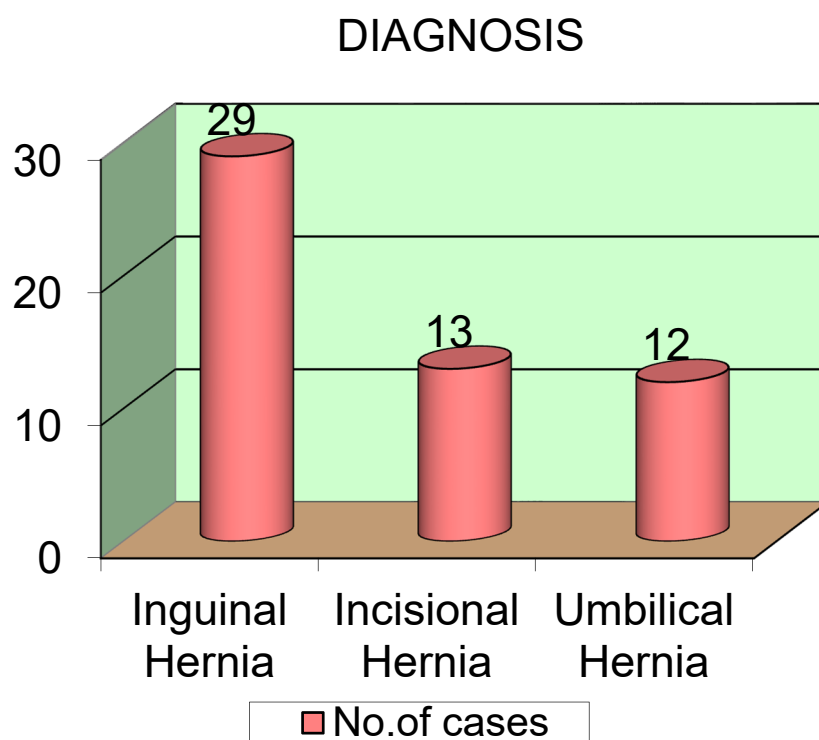


■ Hernioplasty  
■ Herniorraphy

**Table 4 : Diagnosis**

Diagnosis	No.of cases	Percentage
Inguinal Hernia	29	53.7
Incisional Hernia	13	24.1
Umbilical Hernia	12	22.2
Total	54	100.0

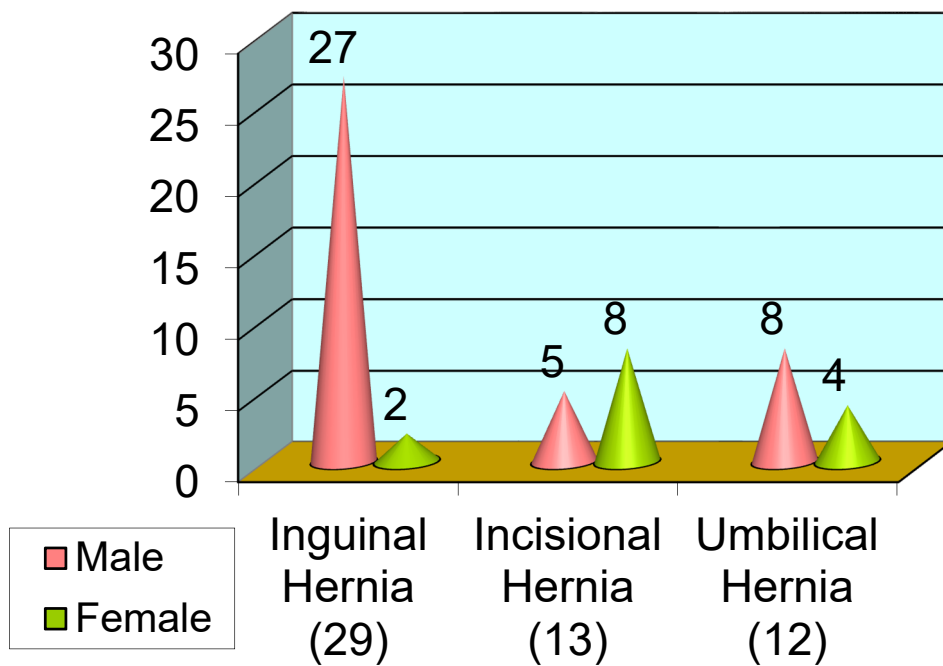
Of all hernias , 29 cases were inguinal , 13 incisional , 12 umbilical  
hernia



**Table 5 : Diagnosis VS Gender Distribution**

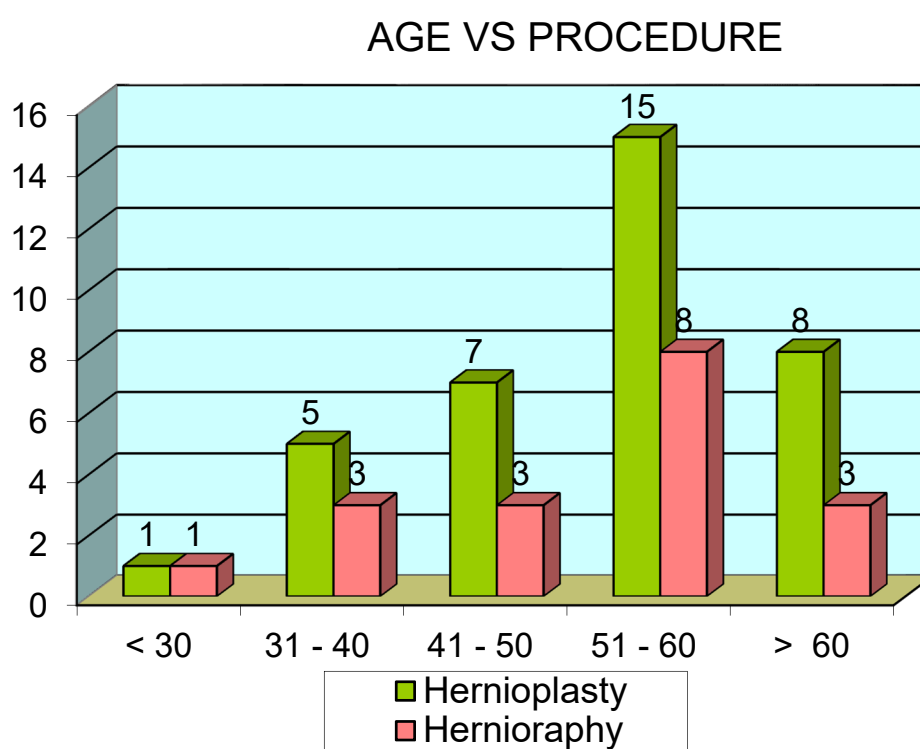
Diagnosis	Male	Female
Inguinal Hernia (29)	27	2
Incisional Hernia (13)	5	8
Umbilical Hernia (12)	8	4
total	40	14

**DIAGNOSIS VS GENDER DISTRIBUTION**



**Table 6 : Age Vs Procedure**

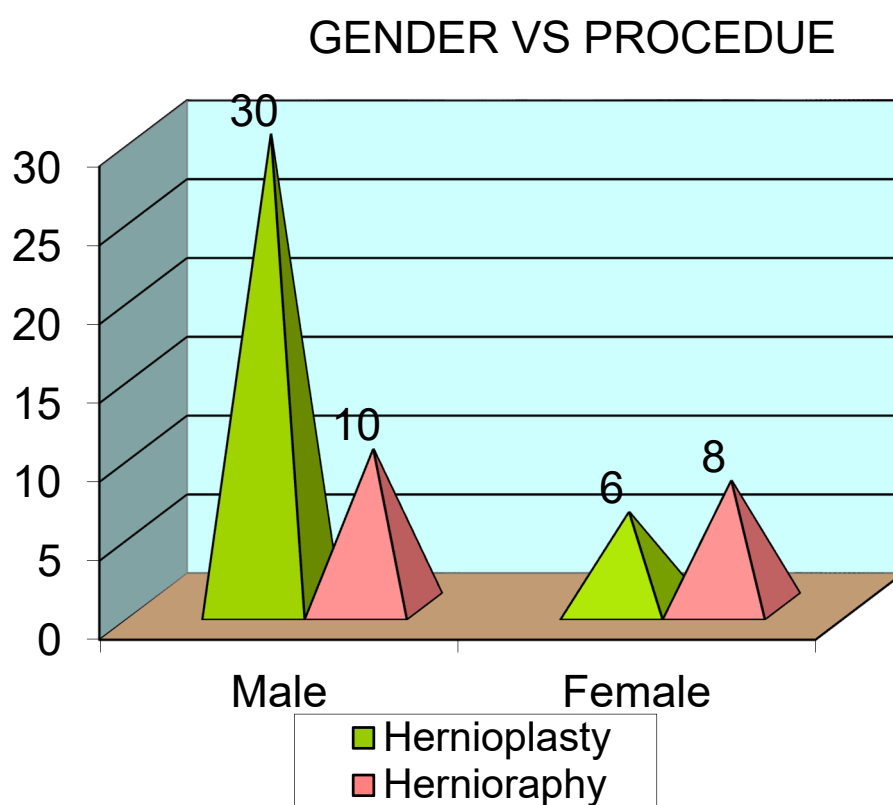
Age in years	Hernioplasty	Herniorraphy
< 30	1	1
31 - 40	5	3
41 - 50	7	3
51 - 60	15	8
> 60	8	3
Total	36	18





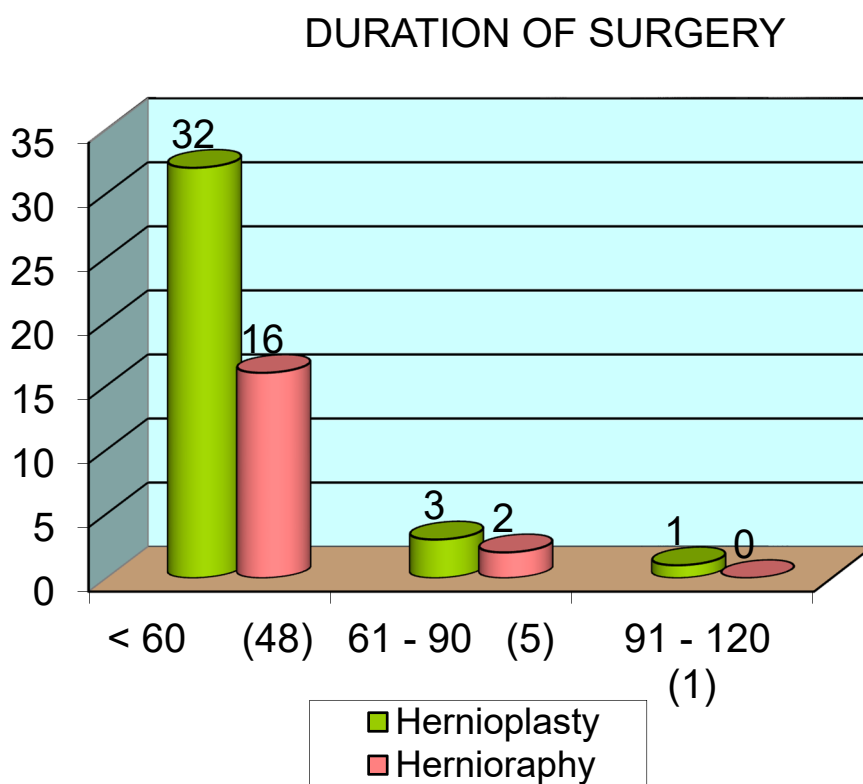
**Table 7 : Gender Vs Procedure**

Sex	Hernioplasty	Herniorraphy
Male	30	10
Female	6	8
Total	36	18



**Table 8 : Duration of Surgery**

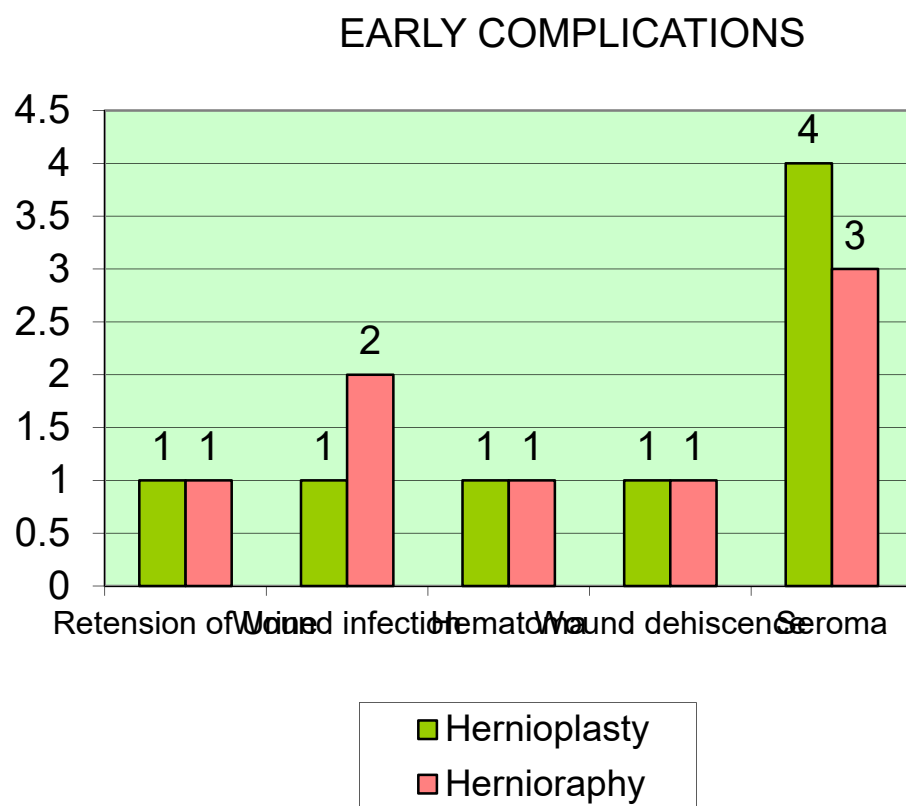
Duration of surgery in minutes	Hernioplasty	Hernioraphy
< 60 (48)	32	16
61 - 90 (5)	3	2
91 - 120 (1)	1	0
Total	36	18



**Table 9 : Early Complication**

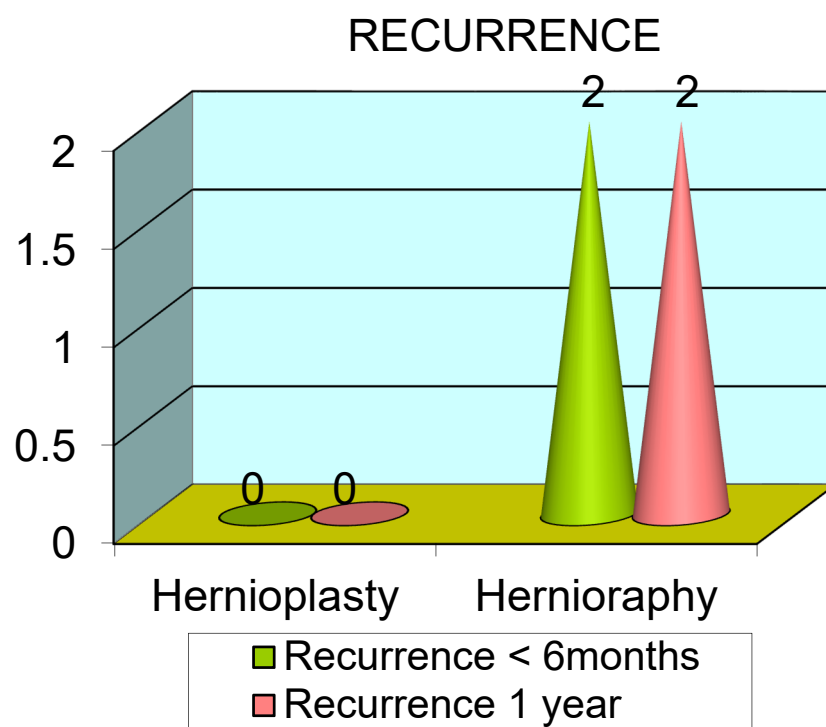
Early Complications	Hernioplasty	Hernioraphy
Retention of Urine	1	1
Wound infection	1	2
Hematoma	1	1
Wound dehiscence	1	1
Seroma	4	3

**Seroma to be the most common complication found in both hernioplasty and hernioraphy**



**Table 10 : Recurrence**

Late Complications	Hernioplasty	Hernioraphy
Persistant pain	4	5
Testicular atrophy	0	0



# DISCUSSION

## DISCUSSION

Recurrence is an important problem regarding obstructed hernias where a herniorrhaphy has been done. So in cases of obstructed hernias where you get a viable bowel with absence of toxic fluid, it is better to go for mesh repair, so that the recurrence rates are brought down to minimum.

In this study, 54 patients with obstructed hernia (umbilical, incisional, inguinal), who underwent emergency surgery, were evaluated for duration of surgery, recurrence, pain, seroma formation and wound complications in two study groups (group A – 36 hernioplasty, and group B – 18 herniorrhaphy).

There were no significant differences between the two groups with regard to age, duration of surgery.

In group A, 36 patients who underwent hernioplasty had polypropylene mesh placed for reinforcement, fixed using 2/0 prolene.

In group B, 18 patients who underwent herniorrhaphy had anatomical apposition of conjoint tendon and inguinal ligament using 2/0 prolene.

Patients were followed up for a period of one year.

In group B during the first 6 month follow up period itself 2 cases got recurred, and in the next 6 months another 2 case got recurred, so in total 4 cases resented with recurrence, comparing with group A there was no recurrent cases, so having a significant value of 0.011.

Rest of the variables like age, sex, duration of surgery, early and late postoperative complications.

# CONCLUSION

## CONCLUSION

In the present study, 54 patients have completed the study protocol. Of this 36 patients in group A (hernioplasty) and 18 patients in group B (herniorrhaphy).

After analyzing the data and observations, the present prospective study demonstrated that the use of mesh in cases of obstructed hernias where the bowel is healthy and if there is no toxic fluid, there is better outcome regarding recurrence rates. However, the sample size in the current study is relatively smaller, so a larger study sample may be needed before any further conclusion can be made.

Although the study sample is small in this present study, it is still wise to recommend hernioplasty in these kinds of cases with normal bowel without toxic fluid. So when performing emergency surgeries for obstructed hernias it's better to use meshes if there is no other contraindication.



# SUMMARY

## SUMMARY

“Prospective study evaluating the use of polypropylene mesh in emergency surgery of obstructed hernias ”

Conducted in department of general surgery at government rajaji hospital, Madurai from march 2016 to august 2016.

Data collected in a prescribed proforma, analyzed and evaluated for recurrence rates, duration of surgery and early/late complications.

Sample size 54 patients with obstructed hernia (umbilical, incisional, inguinal), who underwent emergency surgery, were evaluated for duration of surgery, recurrence, pain, seroma formation and wound complications in two study groups (group A – 36 hernioplasty, and group B – 18 herniorrhaphy). There were no significant differences between the two groups with regard to age, duration of surgery, early complications.

In group B during the first 6 month follow up period itself 2 cases got recurred, and in the next 6 months another 2 case got recurred, so in total 4 cases resented with recurrence, comaring with group A there was no recurrent cases, so having a significant value of 0.011.

# **ANNEXURES**

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**MADURAI MEDICAL COLLEGE AND GOVERNMENT RAJAJI  
HOSPITAL , MADURAI**

**“Comparative study of preservation versus elective division of ilio-  
inguinal nerve on post operative groin pain, in open mesh repair of  
inguinal hernia”**

**PROFORMA**

Name :	I P No :
Age / Sex :	Date of Admission :
Occupation :	Date of Operation :
Address :	Date of Discharge :

**CHIEF COMPLAINTS**

**HISTORY OF PRESENT ILLNESS**

**1. Swelling in the groin**

**2. Pain** :Present  
/

**3. Vomiting:** Present / Absent

**4. Distension of abdomen:** Present / Absent

**5. Other straining factors**

**6. Any treatment before admitting to the hospital** : Yes / No

**PAST HISTORY**

**TREATMENT HISTORY**

Medical : Surgical :

**PERSONAL HISTORY**

**MENSTRUAL HISTORY** (If  
Female)

**FAMILY HISTORY**

## **GENERAL PHYSICAL EXAMINATION**

### **VITALS**

### **LOCAL EXAMINATION**

**A . Inspection :**

**B. Palpation**

**C. Percussion**

**D. Auscultation**

**E. Examination of abdominal muscle tone**

### **SYSTEMIC EXAMINATION**

**A. Per Abdomen :**

**Per Rectal examination:**

**Per vaginal examination (If  
female):**

**B. Respiratory system :**

**C. Cardiovascular  
system :**

**D. Nervous system :**

### **CLINICAL**

### **DIAGNOSIS**

### **INVESTIGATIONS**

**A. Routine blood**

**B. Routine urine**

**C. Others / Special**

### **TREATMENT**

Type of

Anaesthesia:

Type of operation :

### **FOLLOW- UP**

**Complication**

**Started Diet**

**Wound infection**

**Discharged**

## ABBREVIATIONS

AD	Anna domino :After Christ
BC	Before Christ
Cms	Centimeter
ECG	Electrocardiogram
Gms	Grams
H/O	History of
Hb%	Hemoglobin percentage
HBsAg	Hepatitis B surface antigen
HIV	Human immuno deficiency virus
Inj IM	Injection , Intramuscular
ie,	That is
IP No	In patient number
Lt	Left
N	Total number
P	Probability (Significance of difference)
RBS	Random blood sugar
Rt	Right
RCT	Rondomized Controlled trial
R	Recurrence
S/o	Suggestive of
USG	Ultrasonogram
Vs	Versus
Yrs	Years

## MASTER CHART

S.No.	NAME	AGE (YRS)	SEX	IP.NO	DIAGNOSIS	PROCEDURE	SURGERY TIME DURATION	EARLY COMPLICATION					LATE COMPLICATION			SIX MONTHS FOLLOW UP	1 YEAR FOLLOW UP
								RETION OF URINE	WOUND INFECTION	HEMATOMA	SEROMA	WOUND DEHISCENCE	RECURRENC E	PERSISTENT PAIN	TESTICULA R ATROPHY		
1	SEETHA	60	F	10258	OBST UMBILICAL HERNIA	HERNIORRAPHY	60							✓			
2	SUBBULAKSHMI	58	F	11750	OBST Lt INGUINAL HERNIA	HERNIORRAPHY	55										
3	MARIAMMAL	60	F	1865	OBST INCISIONAL HERNIA	HERNIORRAPHY	30										
4	ALAGUSHANTHI	59	F	5057	OBST INCISIONAL HERNIA	HERNIORRAPHY	50	✓									
5	MARIAMMAL	58	F	23105	OBST INCISIONAL HERNIA	HERNIOPLASTY	65										
6	SARASWATHI	59	F	23719	OBST INCISIONAL HERNIA	HERNIOPLASTY	30				✓						
7	MAHARIBA	55	F	69558	OBST UMBILICAL HERNIA	HERNIOPLASTY	45							✓			
8	FATHIMA	59	F	34821	OBST INCISIONAL HERNIA	HERNIOPLASTY	30										
9	ALAGUVANTHI	60	F	50552	OBST INCISIONAL HERNIA	HERNIOPLASTY	60		✓								
10	MALATHI	55	F	61519	OBST UMBILICAL HERNIA	HERNIORRAPHY	50						R	✓			YES

11	BALAMANI	33	F	63821	OBST UMBILICAL HERNIA	HERNIORRAPHY	30										
12	CHELLATHAI	52	F	10328	OBST INCISIONAL HERNIA	HERNIORRAPHY	45				✓						
13	MOOKAMAL	67	F	11788	OBST INCISIONAL HERNIA	HERNIORRAPHY	45						R	✓		YES	
14	MADASAMY	29	M	7072	OBST Rt INGUINAL HERNIA	HERNIOPLASTY	45							✓			
15	MOHAMMED ALI	75	M	7045	OBST Lt INGUINAL HERNIA	HERNIOPLASTY	80				✓						
16	AZARUDEEN	35	M	11750	OBST Lt INGUINAL HERNIA	HERNIOPLASTY	50	✓									
17	RAMANATHAN	39	M	1E+05	OBST UMBILICAL HERNIA	HERNIORRAPHY	45										
18	PAANDI	31	M	1E+05	OBST Lt INGUINAL HERNIA	HERNIOPLASTY	55							✓			
19	RAAMU	60	M	21815	OBST UMBILICAL HERNIA	HERNIOPLASTY	90										
20	MALAIYAMAN	55	M	23105	OBST INCISIONAL HERNIA	HERNIOPLASTY	30										
21	PALANISAMY	59	M	1E+06	OBST Rt INGUINAL HERNIA	HERNIORRAPHY	45				✓						
22	MUTHUGANESH	28	M	18564	OBST Lt INGUINAL HERNIA	HERNIORRAPHY	60		✓								
23	LAKSHMI	55	F	68201	OBST INGUINAL HERNIA	HERNIOPLASTY	110										
24	SELVARAJ	42	M	68413	OBST INCISIONAL HERNIA	HERNIOPLASTY	30										
25	NANDHAKUMAR	45	M	62535	OBST UMBILICAL HERNIA	HERNIORRAPHY	30						R	✓			YES
26	THALAPATHI	50	M	13277	OBST Lt INGUINAL HERNIA	HERNIORRAPHY	45										
27	SELVI	49	M	11822	OBST INCISIONAL HERNIA	HERNIORRAPHY	60			✓							

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CERTIFICATE**

Name of the Candidate : Dr.Sivakumar Ganeshan  
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Period of Study : 2015-2018  
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Research Topic : A prospective study evaluating  
the use of polypropylene mesh  
in emergency surgery of  
obstructed hernias  
Ethical Committee as on : 27.07.2017

The Ethics Committee, Madurai Medical College has decided to inform  
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## **CERTIFICATE - II**

This is to certify that this dissertation work titled **A PROSPECTIVE STUDY EVALUATING THE USE OF POLYPROPELENE MESH IN EMERGENCY SURGERY OF OBSTRUCTED HERNIAS** of the candidate **Dr.SIVAKUMAR GANESHAN** with registration Number **221511125** for the award of **M.S.**, in the branch of **GENERAL SURGERY**. I personally verified the urkund.com website for the purpose of plagiarism Check. I found that the uploaded thesis file contains from introduction to conclusion pages and result shows **4** percentage of plagiarism in the dissertation.

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